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AVIATION

The Oldest American Aeronautical Magazine

SPECIAL FEATURES

Final Preparations FOR THE AIR RACES

Expanding Markets WHILE PROMOTING SALES

AERONAUTICAL *Engineering* SECTION

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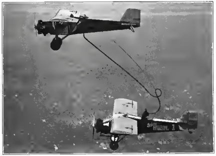

REFUELING THE RECORD BREAKING ENDURANCE PLANE
The photograph shows how gasoline was supplied to the St. Louis Robin enabling the ship to exceed by many hours the previous endurance record set by the "Angeleno." Forest O'Brine is piloting the ship and Dale Jackson is handling the hose. The refueling plane was manned by C. Ray Wassall and F. V. Chaffee.

The Record Cracked

the Paint did not!

420 hours, 21½ minutes of continuous flying! 420 hours, 21½ minutes of continuous strain on men, motors *and paint!* And, because none of the three cracked, the St. Louis Robin was able to add more than one week's time to the best previous mark for sustained flight.

When it landed, the plane was in such excellent shape that it could have gone on for many, many more hours if necessary. The motor was as powerful as ever. The pilots were in splendid physical condition —*There was not a single crack in the fabric.*

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We have some interesting facts about aviation paint for men who want the toughest, most durable fabric finish that money can buy. If you would like to have it, simply drop us a line. Your request involves no obligation whatever.

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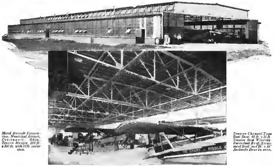

Metal Aircraft Corporation, Municipal Airport, Cincinnati, Ohio. Truscon Hangar 100 ft x 300 ft, with 70 ft center span.

Truscon Channel Type Steel Door 68 ft x 16 ft. Truscon Steel Windows, Ferrodeck Roof, Structural Steel and 16' x 16' Jackknife Door in rear.

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▲ ▲ ▲ ▲ It takes a specialist to produce a specialist ▲ ▲ ▲

THERE are three main factors to consider in the selection of a school of instruction in aviation. Are the courses offered complete and comprehensive? Is the flying equipment new and is it powered with modern motors? Are the instructors competent in every sense, experienced, and are they capable of developing a pilot's best talent? In other words, are the instructors specialists?

The vast difference today in the caliber of flight instructors results directly in the wide variance in efficiency of pilots who apply to the Department of Commerce for a license. And the same condition is responsible for the number of pilots the Department of Commerce refuses to license until those pilots have had additional instruction . . . at additional expense.

Spartan School executives believe the reputation of a school rests largely in the hands of its instructors and upon their ability to produce excellent pilots . . . specialists . . . without unnecessary expense to the student. Spartan instructors were chosen by that standard. They are outstanding pilots. They have both scientific knowledge and a background of wide experience. And they have character and personality which fit them to produce pilots who are specialists.

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Write for 32-page illustrated book . . .
"Training that Produces Natural Pilots"

SPARTAN SCHOOL OF AERONAUTICS
TULSA, OKLAHOMA

What Facts "Stand Out" in Airport Lighting?

By E. J. DAILEY
Lighting Sales Manager
Graybar Electric Company

This is Number 4 of a series of advertisements whose purpose it is to reduce the information on airport lighting to its simplest terms.

1. In general, what is the significance of good Airport Lighting?

The most important phase of commercial aviation today is the development of airports. Air traffic now waits on its terminals, and ninety per cent of all air-line activities are ground activities. And of all ground activities, in nearly every airport, the problem of night lighting stands foremost in immediate vital importance.

2. What is the commercial significance of good Airport Lighting? Does it pay?

The "edge" held by a first-rate airport is already assuming a tremendous commercial value. Important air mail and other concessions tend to seek the best equipped fields. What this may mean in the future is almost beyond computation.

The community possessing such an airport may expect generous dividends in the form of increased prestige, expanded business, and, more directly, the attraction of many new industries related to aviation.

3. What are the requirements for an "A" rating?

The Department of Commerce

lists seven requirements for an "A" rating. An airport beacon. Boundary lights. Obstruction lights. Hangar floodlighting. Field floodlighting. An illuminated wind direction indicator. A ceiling finder. And, also, continuous operation from dark to dawn.

4. What is the fundamental purpose of these requirements?

These requirements are intended to aid the pilot — to identify the field, to help him judge height and distance, and to show him the best approaches and the obstructions to be avoided; in fact, to give him a distinct, visible picture of the whole field.

5. In summary, what does all this accomplish?

A well-lighted field must be easily found, easily identified, and as easy to land upon by night as by day.

* * *

And finally, it must be remembered that each field has its own individual requirements. The ultimate guarantee of good lighting is not equipment alone — but the proper *application* of that equipment.

Graybar's Airport Lighting Department — we may suggest at this point — stands always ready to offer its willing cooperation to those interested in this subject. Let this coupon bring you more information.

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GraybaR
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Offices in 72 principal cities

GRAYBAR ELECTRIC CO.
Graybar Bldg. New York, N. Y.
Gentlemen:
Please send us more information on Airport Lighting
Name
Address
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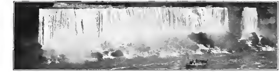
AIRPORT · LIGHTING



"Niagara," the Ford tri motor plane operated by Sky View Lines, Inc. of Buffalo about to take off for a flight above Niagara Falls

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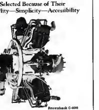

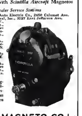

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A McGRAW-HILL PUBLICATION .... ESTABLISHED 1916

EDWARD P. WARNER, *Editor*

VOLUME 27 . . . ***August 17, 1929*** . . . NUMBER 7

Air Mail "Tests"

TO THOSE who are professionally engaged in aviation, and who have as a matter of course kept in touch with each step in the evolution of America's air mail service, it seems almost incredible that any intelligent man can still be uninformed on where that service goes and what it does. The ballyhoo has been loud, long, and continuous. The Post-office Department, the air mail contractors, the aeronautical and the general press, Chambers of Commerce and other civic organizations galore, and a host of private citizens interested in aeronautics or merely public spirited, have all joined in preaching from the text of the air mail's possibilities, explaining its present status, and telling how, when, and where it can be used to advantage. And yet, after all these years of effort, there come occasional evidences that the lesson has not yet been learned. The air mail service is still liable to be overlooked where it would be of value and should be used. Attempts are still made to use it where it can be of no service, leading only to disappointment and to criticisms as sweeping as they are unjust. The work of instructing the public upon what they can really get from this new channel of communication must go on unrelaxed. It must even be intensified.

Only a few weeks ago the Washington *Post*, a leading journal in the nation's capital, conducted a test of the air mail. The results as the newspaper interpreted them were summarized in the headline, streaming across three columns of the first page, "Test by Post Reveals Air Mail Not Always Speedier Than Trains." Subordinate heads, reinforced by a tabulation, explained that in 46 trials the airplane had beaten the railroad in 23, run a dead heat in fourteen, and been vanquished in nine. To the headline-skimmer and no doubt to many of the *Post's* readers, it seemed a shocking record.

Shocking,—until the nature of the test is examined. After that it seems less strange.

The 46 trials, plus two uncompleted tests, corresponded to the 48 states. For some obscure reason the capital of each state was selected as the starting-point of the race. If the air mail were a political service it would be appropriate to test its performance from political centers, but it is not. Its organization and its mission are not political but commercial. The state capitals, with hardly a dozen exceptions, are of insignificant importance as commercial centers, and they have properly been neglected in blocking out the first main lines of the air map. Only fifteen have a population exceeding 100 000. Only 20 of the 48 are touched by any air mail line, even the most minor feeder.

NO ACCOUNT was taken of distance. We have supposed for years that it was common knowledge among educated people that under present conditions the airplane is of little or no use over very short distances. We have evidently been wrong. In this "test" a race between "air mail" and rail mail from Annapolis, the capitol of Maryland, to Washington, 35 miles distant by highway, was given as much weight as one extending across the continent. Annapolis not only has no air mail, it has no landing field. At least three of the "air mail" letters traveled all the way by train. At least three more were mailed from points within reach of an over-night run by train, and could not beat the railroad-borne letters into the newspaper office unless delivery were to be made immediately after the arrival of the mail plane about two in the morning.

No account was taken of schedule. The air mail's operations have been scientifically planned to use a maximum of over-night flying and lose a minimum of time out of the business day. Most business offices, in spite of all pleas to distribute the mailing load off the peak, send out the great bulk of their correspondence late in the afternoon, and in most of the great trading centers the air mail comes along to catch it without delay. Yet in this group of tests, nine of the 46 letters were mailed before eleven in the morning, 21 before one in the

afternoon, and eight at 7:30 in the evening or later. Hardly a fair selection of business mail.

We have no desire to dwell upon criticism of the *Post's* scheme. Basically the idea was sound. We would be the last to claim that the air mail's reliability record has achieved perfection, or that further improvement is not needed, but the record being made even now is a good one. It is better than the general public supposes. It is certainly far better than the readers of the *Post* would have been led to suppose. The public are entitled to know just how good a service they are getting. Tests for that purpose are to be heartily commended,—but they should be fair tests.

To revert to our introductory paragraph, that so misleading a group of results should have been secured and circulated in good faith makes it evident that there is need for a vigorously continued educational campaign, with special reference to the latest mailing hour in each city to catch each plane. Air mail posters and stickers ought to carry that information in full wherever possible. For the largest cities, either the Post Office Department or the air mail contractor ought to prepare maps, better and more detailed than any that have so far existed, indicating the parts of the country to which air mail can profitably be used for mailings at various hours of the day. To withold knowledge on such matters may draw in a few letters that would go by rail if the sender realized that the airplane could save him nothing at that particular time and on that particular route, and may slightly increase the revenues of some of the contractors, but in the long run it will be most profitable to have given the public all the facts all the time. A single dissatisfied customer can give the air mail service much more than five cents worth of unfavorable publicity.

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Gate-Crashing Epidemic on Aircraft

IT ALL BEGAN with Clarence Terhune, a youth whose biography, as picturesquely rendered by the pyrotechnic press, indicated him to have a fixity of purpose in life which is unhappily rare among young men. Clarence, if his past history was accurately reported by the newspapers, had chosen the career of going on trips where he was not invited and was not wanted, and had pursued it with a success that attained a climax when he crept on board the Graf Zeppelin just before her departure from Lakehurst for Friedrichshafen. Sob sisters unsheathed their typewriters to extol him as the embodiment of the spirit of youth. His fellow-countrymen who wrote letters to the press to make public display of their delight over the success of the cute trick that he had played had the satisfaction of seeing themselves outdone by a part of the population of Friedrichshafen, who fairly took Clarence to their hearts. Six months ago the "one and only original Zeppelin stowaway" was still a vaudeville headliner, but we have enough faith in the collective good sense of the American people to trust that they have turned their backs on him by now.

Clarence may still be original, but he is no longer the one and only. After him came Arthur Schreiber, and the jest began to pall. It needed neither a pilot nor an aeronautical engineer to perceive the glaring indecency of arbitrarily adding a hundred and fifty pounds of useless weight to a machine already loaded to the very limit and balanced with the last degree of refinement for a take-off. Arthur found himself less of a hero than he may have anticipated, and at last accounts his story of his adventures was still unpublished and his theatrical contracts were hanging fire.

NO ATLANTIC FLIGHT now being complete without its stowaway, Albert Buschko thoughtfully added himself to the complement of the Graf Zeppelin when she left Friedrichshafen two weeks ago, and thereby gave Doctor Hugo Eckener a chance to establish for himself a new fame as the man who solved the stowaway problem.

To have done the obvious thing, and to have paused to land the unwelcome passenger at once, would merely have insured that several emulators would have laid their plans farther in advance and concealed themselves more carefully when the next trip was made. To lock him up in a freight compartment, refusing to discuss him with the passengers or even to give out his name, and to turn him over to the American authorities for immediate deportation, took all the romance out of his performance. That may seem to the admirers of previous stowaways and their exploits to have been cruel and inhuman treatment. Admirers of cold common sense, and believers in aircraft as sober instruments of sane transportation enterprises, will hail Doctor Eckener's course with a sigh of relief, tinctured only by regret that our own immigration officials felt it necessary to provide the opportunity of even a little increased publicity for the "young man of perverted ideas" by allowing the press photographers and interviewers to have access to him.

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Thirsting for a Thrill

WE HAVE BEEN SLOW to criticise the daily press for their reports of aircraft accidents. The reports are often inaccurate, and they are often played up with an excess of sensationalism, but we give credit in most cases for an honest attempt to state correctly facts that are often difficult for even an expert to determine. We have no desire to join in the ostrich-like demand sometimes heard for secrecy, or for throt-

tling the stories of aerial mishaps down to below what their real importance justifies or suppressing them entirely. Only by knowing the truth about what has gone wrong can we prevent a recurrence of the trouble. Only by dealing with the public with full candor can we prevent the spread of rumors sure to be much worse than the facts. Even now, the average newspaper reader has an exaggerated idea of the dangers of flight because of the incompleteness of the information bearing upon that point that he ordinarily receives. He fears frequent reports of accidents, but he has to guess for himself, unless he follows very carefully the releases of the Department of Commerce, at the total number of mishaps and the total amount of flying done. This guess is commonly worse than the reality.

We do, however, feel entitled to protest when the desire to find a fresh excitement for each edition leads to the broadcasting of ominous hints of impending disasters of which there was never the smallest probability. To throw the mildest occurrences into the shadow of alarmist headlines is only one degree less objectionable than deliberate falsification, and it is far more common.

THE GRAF ZEPPELIN is on her way back to Germany as these paragraphs are being written. The crossing will undoubtedly repeat the experience of the preceding three. The headlines in a certain type of paper will scream: "Airship thought to be in danger", "nothing heard from Graf for six hours", "Zeppelin approaching giant storm area", and the like. Even if the statements be literally true, they are outrageously misleading—and the editors must know it. Some of them might with equal accuracy have been applied to the Bremen during her recent maiden voyage, and with the same implications, were it not that the general public is too well versed in the performance of ocean liners to accept scare heads concerning them at their face value.

There is no way of controlling the newspapers that elect to sound the sensational note. If misleading headlines will sell papers, some journals will continue to use them. We can, however, make ourselves heard in our own communities, and we may be able to convince some publishers among that group that to treat every novel or notable flight, whether of airplane or airship, as a prospective tragedy, is unprofitable practice. Papers that do that may gain some temporary profit, but they will alienate sober readers. In the meantime, they deserve not a penny's support from the aircraft industry. Every aeronautical advertiser, in his dealings with the general popular press, has a responsibility towards the industry of which his company forms a part. The periodical that makes a conscientious effort to give a fair and complete rendering of aeronautical news deserves the backing of aeronautical people. In the long run, too, the paper that shuns inaccuracy and misleading sensationalism will prove the most profitable medium.

What Constitutes "Refueling"?

WHEN CAPTAIN LOWELL SMITH, later to command the Army's flight around the world, and Lieutenant Richter first hit upon the plan of refueling one airplane from another in flight the international rule-making bodies were unready to deal with the problem presented. The scheme was so novel that there was nothing in the rules governing duration flight to prohibit the taking on of supplies elsewhere than from the ground. The International Aeronautical Federation was prompt to deal with the emergency, and to put refueling records in a separate class.

Those were simple days. No one even then thought of supplying the record-making plane with anything but fuel and oil, and possibly a few simple supplies for the pilot. We have progressed, and the fliers now receive specially prepared banquets, reading matter, toilet utensils, window shades for the cabin,—and parts for the engine. At this point an interesting new problem arises.

O'Brine and Jackson during their recent successful attempt on the record more than once accomplished the remarkable feat of changing spark plugs in flight. That they did so, of course, in no way way impairs the significance of their flight. The plugs are light accessories which are known to be apt to give trouble after long operation, and an ample supply for the whole flight could easily have been carried at taking off. To change plugs, in other words, is quite as practicable in a non-refueling as in a refueling trip. But where do we go next?

FOR A MULTI-ENGINED PLANE on which one engine can be stopped without interrupting the flight, it is but a step from the supply of spark plugs to the provision of valve springs, valves, or even cylinders and other parts of larger bulk. It is not even inconceivable that a complete new engine of moderate power might be received and installed in flight. With those possibilities in prospect some very interesting records could still be made, but they would not be the same type of record that has been established so far. The interest of refueling flights as a means of engine testing would have been diminished if not destroyed.

It has been plentifully demonstrated that the continuous running life of a good modern engine without any such replacement is as long as anyone could reasonably wish that a plane should stay aloft. The possibilities hinted at here should be met before they arise. The National Aeronautic Association, as the official body controlling aeronautical sport in the country where refueling flights have been most popular, should take the lead in presenting to the Fédération Aéronautique Internationale, the well-known F.A.I., the recommendation that no transfers of engine or airplane parts from the refueling plane should be permitted.

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Final Preparations FOR THE NATIONAL AIR RACES

By JOHN T. NEVILL

LIKE A LOCOMOTIVE, steamed up, and rolling speedily down the right-of-way toward its destination, the 1929 National Air Races and Aeronautical Exposition, with Clifford W Henderson, managing director at the throttle has negotiated the grade and, at this writing, is beginning to coast in to the goal of success in what Henderson believes will be the criterion of all future American aeronautical events

The simile is Henderson's own, and he bases his belief in the Cleveland event's size and splendor, and efficiency of operation on the present tendency of the aircraft industry toward mergers The mergers, he believes, will decrease the necessity for large numbers of individual exhibits and contestants in aeronautical shows and aeronautical competitive events, despite the certain increase in plane production

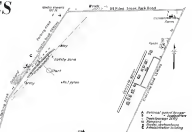
WHEN the 1929 National Air Races and Aeronautical Exposition, called the 'Air Classic of the Century,' opens in Cleveland on August 24 for a ten-day period, the American aircraft industry and the lay American probably will witness a more pretentious more costly, more colorful, and more inspiring execution of the annual event than this country has ever seen before Briefly, the races will embrace a total of 35 closed course competitive events in addition to an interesting assortment of military demonstrations by Army, Navy Marine Corps, and National Guard planes The Aeronautical Exposition housed in the Cleveland Public Auditorium an $11,000,000 structure located twelve miles from the airport will include approximately 320 exhibits, among them more than 100 airplanes

Administration Building of the Cleveland Municipal Airport with Balconies for the Press Judges and Observers

The combined races and exposition will cost the two non-profit corporations financing them an approximate total of $400,000, of which $300,000 has been underwritten $40,000 in actual operating overhead will be spent and including the dirigible "Los Angeles," more than $6,000,000 worth of flying equipment will be involved

Every event either directly or remotely linked with the Air Races will be of an aeronautical nature Among the more promising of the free attractions is a musical extravaganza, conceived by Mr Henderson, which will take place nightly on the terrace between the two exposition buildings The production, called "Wings of Love," has a cast of 120 people, whose movements are actuated by music typically and fittingly aeronautical "Wings of Love" will be presented at 11 p.m. each night just after the close of the aeronautical exposition The nightly program at the airport calls for a pyrotechnic display gorgeous in character and huge of proportion, as well as demonstrations of night flying and fire works over the lake front A floral parade, four miles long, participated in by practically all of the uniformed ushers, will open the races and the usual assortment of comedy acts will occupy a large place on the hill

Without visiting the nine rooms comprising the Air Race executive headquarters on the parlor floor of Hotel Cleveland, it would be difficult to conceive the tremendous amount of work involved in the promotion and execution of such a mammoth affair As this is written, Mr Henderson has a staff of approximately 75 persons all of them completely absorbed in the idea of putting the project over The staff and committee members, employees and participants will number more than 8,300 when the races open At this writing there are 49 department heads and committee chairmen making daily progress reports to the managing director



Plan of the Municipal Airport, Showing the Relation of the Grandstands and Administration Building to the Field and Hangars

WHAT ARE the problems to be met in planning and carrying out such a huge undertaking as the National Air Races?

The principal problem and one which is characteristic of nearly all such events, as Mr Henderson sees it, is to find a temporary personnel made up of men of a permanent caliber. The acquisition of such men is not an easy matter for the simple reason that men of that type usually are not unemployed A number of Mr. Henderson's department heads are business men interested in the advancement of aviation whose affairs were such that they could leave them to go to work on a salary for the air race association Mr Henderson's own brother, a prominent automobile dealer in Los Angeles, sold his business that he might devote his entire time to the work in Cleveland One of the department heads is a principal of a school in the West whom Henderson chanced upon in his search for the proper kind of aides There are 650 people in the traffic and ticket personnel, practically all of whom, Henderson said, are bank cashiers and university men It is interesting to be told that in his search for men of the right type Mr Henderson has rejected all applicants of the professional promotion class.

In detailing some of the other problems confronting the management of the 1929 National Air Races it is convenient to start at the beginning and meet them as they appear It will be recalled that the Cleveland chapter of the National Aeronautic Association and the Cleveland Chamber of Commerce sent a committee headed by Floyd Logan and Clifford Gildersleeve to Los Angeles last year to petition for the 1929 races After the petition had been granted, a representative group of business men got together and formed two non-profit operating corporations—National Air Races of Cleveland, Inc, and National Aeronautical Exposition, Inc It was figured that the cost would be in the neighborhood of $200,000 However, Cleveland banks responded so eagerly that $260,000 was raised This sum has since been increased to $300,000, without one dollar having been brought in by means of professional money raising The executive committee of both operating corporations is headed by Alva Bradley, president of the Cleveland Baseball Company, and includes Floyd J Logan, president of the Floyd J Logan Aviation Company, L W Greve, treasurer Cleveland Pneumatic Tool Company; Col Benjamin F Castle, president, Great Lakes Aircraft Corporation; Allard Smith, vice-president, Union Trust Company, and I F Freiberger, vice-president, Cleveland Trust Company Henderson was brought to Cleveland in February, and Logan was placed in charge of contests as chairman of the race committee

"THE EXECUTIVE COMMITTEE brought me here in the dead of winter," Henderson told the writer, "and one of the most difficult problems of all was tackled—that of firing up the cold mechanism and getting things to steaming Although there was in Cleveland a widespread belief in the advantages offered by the National Air Races, there was very little appreciation of what it was all about I placed an ad in the paper, hired a couple of girls and a couple of typewriters, rented one room as an office, and set up the original 'executive headquarters.'

"Work of the next two months involved the actual designing of the project A venture of this kind is designed just as an airplane is designed, and during this period there is none of the ballyhoo that must necessarily accompany the project later However, throughout this time I was making contacts by means of motion pictures

of last year's races which were shown before dozens of clubs and civic organizations of the city In the meantime, I was also interviewing applicants for positions in the organization This was tedious work because of the care we took in selecting our personnel We have made it a policy not to use anyone having a background of professional promotion work One reason for this is that our project is designed as a constructive merchandising medium, and not an entertainment project The entertainment features are purely incidental If the National Air Races fail to broaden the aircraft market they should be taken off the boards The Cleveland races are also designed so as to be in the truest sense a national event, tying in geographically every section of the country

"This year we will introduce a number of innovations on the National Air Race program, some of them so daring as to be radical The womens' air derby from Los Angeles to Cleveland is one such event It is the annual classic's first real gesture signifying the entrance of womanhood into aviation Such a departure is attended by a lot of responsibility, but the participation of women in flying activities demanded it The races would not have been complete without it

"Another, and one of the first innovations designed in the program was the all-Ohio air derby This event in which the contestants will fly around the rim of Ohio was created to give the races a background of local competition The introduction of gliders and the staging of the first national glider competition should give an impetus to great national expansion in glider activities The entrance of lighter-than-air craft is another important progressive gesture

"This year, also, we will have 900 costumed and uniformed attendants moving about in a decorative scheme comparable with the most lavish and exclusive horse-shows Every part of the ten days' activity, in fact has been designed with this idea in view Some of the decorative scheme and service facilities to be enjoyed this year are a further development of ideas originally introduced at Los Angeles last year Many of them however will be seen at the air races for the first time"

ONE OF the most radical departures from air race procedure to be seen at Cleveland is the introduction of "horse race starts" It involves starting all of the contestants in a given race at the same time, after which the participants fly a "scattering lap" before beginning the laps around the smaller triangular course A "scattering pylon" is located 20 miles from the airport The contestants must circle this pylon and return to the field before starting the grind around the smaller course, This feature was introduced to decrease hazard and to make it easier for spectators to know how the race stands at any stage of the contest Mr Henderson expects the "scattering lap" to revolutionize closed course airplane racing

THE STAGING of an aeronautical exposition along with the national air races was introduced by Mr Henderson at Los Angeles last year Although the exposition attracted large crowds, it was found that the housing of such a show on, or too near, the airport is impractical, since the patrons are lured to the open field by the hum and roar of planes in action This year the exposition is being held concurrently, but is far enough away to be non-competitive The exposition is designed as a retail selling show, and undoubtedly will attract many pilots Unlike all previous aircraft shows the Cleveland exposition will have certain hours daily set aside for the industry during which the public will not be admitted

The problem of having a properly equipped airport—a most essential requirement in a project of this kind—has been met by the city of Cleveland, which is spending $450,000 in conditioning the municipal airport for the races Like the city government, the county officials have also realized the magnitude of the event and are conditioning and widening eight miles of highway to facilitate the flow of traffic to and from the airport

An interesting difficulty confronting Mr Henderson and his aides was the necessity for leasing property adjacent to the airport in order to prevent a shortage in gate receipts Past experience has revealed that hundreds of persons who can find a vantage point on property adjacent to the airport property will not pay in the regular way to witness the activities on the flying field That this condition might be eliminated in Cleveland, the executive committee decided to lease as much of the surrounding property as was thought advisable

Since practically all of the property sought was subdivided and the owners scattered all about the United States one can imagine the work the leasing process entailed However, the owners were located and 80 per cent of the adjacent property approximately 1 800 acres leased at $1 per parcel for the period of the air races Through the co-operation of the Ohio National Guard, a force of 200 national guardsmen will patrol the leased territory keeping it clear of persons who do not wish to pay the $1 admission fee at the gates of the airport

Grandstands Erected to Accommodate Spectators at the National Air Races

Expanding Markets

WHILE PROMOTING SALES

By JUSTIN A. McINANEY
Vice-President in Charge of Sales
Alexander Aircraft Company

BY FAR the greatest strides forward in commercial aircraft manufacture today are being made in distribution Planes and production methods are essentially the same as they were two years ago although material improvement has also been made in this direction

Stimulation in aircraft sales methods may be traced to the exhaustion of cheap war production engines which for a time placed manufacturers of the popular three-place open plane in a doubtful situation Should they attempt to maintain heavy production schedules, knowing that the planes, powered with expensive new-production air-cooled engines, would sell at retail for double their price with OX-5's?

Many observers predicted a slump in aircraft production This has failed to materialize Why? The reason lies chiefly with better sales promotion on the part of the more progressive manufacturers

In the Alexander Aircraft Company, for instance, we have enjoyed particularly good success with new plans for selling on time payments, and for enlisting active flying sales promoters

The sales promotion plan has been received with some skepticism by the industry and mistaken alarm on the part of one or two of our distributors, who have gained the impression that we intend to interfere with their time-honored territorial protection Naturally, we would not consider such a step unless as our franchise specifies, the territory is not being properly worked Our sales promotion efforts are confined almost entirely to rich open territories

Briefly stated, we are lending transport pilots a brand new Eaglerock demonstrator with which to tour open territories, make sales on fifteen per cent commission hop passengers to defray expenses, and make money both for themselves and the factory Two transport pilots have already taken out demonstrators and are in the field The first to do so was Joe Ben Lievre, veteran war time instructor and test flyer, now a commercial operator with headquarters at San Antonio

The industry evidently cannot quite swallow the idea that we are willing to turn over a new airplane to a pilot for him to use for personal profit Naturally, we profit ourselves from increased sales and greater popularity of the plane

Justin A McInaney

The sales promoter pays his own operating expenses, which may be defrayed by barnstorming, and of course is responsible for damage to the ship, reasonable wear excepted

A fifteen per cent commission is allowed on each plane sold If the sales promoter buys his demonstrator, we allow a twenty per cent commission The salesman can pay gas and oil expenses by hopping passengers In exchange for the use of the plane in passenger work, the factory asks a small hourly charge, usually around $2, to cover depreciation on the engine

We were led to try the plan by a desire for more active representation in open territories The more representatives the more sales This saying has demonstrated its truth in the experience of the Alexander Film Company, our sister organization

THE PLAN enables an automobile salesman, for instance, to capitalize on a desire to learn to fly and enter the game on a business basis He can hire a transport pilot on a split commission agreement, take out a new Eaglerock and learn to fly on the road while earning revenue from his sales and passenger receipts Our sales force includes eight distributors and dealers who are also selling automobiles and there are about 25 Eaglerock distributors and dealers who were formerly in the automobile industry

Automobile men usually make good airplane salesmen They have the sales experience which many pilots must acquire On the other hand, persons unfamiliar with the industry must learn the fundamentals of flying so as to present an intelligent sales talk Recognizing these facts, the Alexander company opened in July one of the first

schools for airplane salesmen in the country Practical airplane salesmanship is taught in lecture rooms and in the Eaglerock factory We aim to supply distributors and dealers with trained airplane salesmen

We have invited competitive dealers to attend the class, on the theory that a general improvement in aircraft sales methods would benefit the entire industry, and we would profit with the rest of the field

By appointing five dealers and financing himself sufficiently from his earnings a sales promoter may qualify himself for a distributor franchise covering the territory he has worked A small commission is allowed the promoter on sales made by his appointed dealers

WE HAVE BEEN ABLE to smooth the path of the flying promoter by introduction of a new time payment plan, liberalizing the terms and adding thousands of potential prospects to the promoter's list

Our new A. A. C. plan [described in detail in AVIATION for July 27—Ed] should enable sales promoters to average a sale a week It is a financing plan for aircraft sales with terms as reasonable as those in the automobile industry A forty per cent down payment is asked, and installments on the balance are scattered over a 10 months' period The finance charge on the unpaid balance amounts to only ten per cent No insurance is required on the plane, nor is the distributor required to endorse the note covering the unpaid balance on the ship Both concessions are meeting with wide favor Airplane insurance remains too costly and no distributor likes to play the banker and endorse a purchaser's note

A card index system at headquarters protects a sales promoter on prospects in a definite amount of open territory, if he leaves that region for a reasonably short length of time to work another part of the country

Recently we circularized all transport pilots in the country on this plan The response was gratifying Names of inquiring parties are referred to local distributors, who attempt to sign them as dealers Failing in this, they turn back the names to us and we place them with a demonstrator in an open territory

Increased sales resulting from more intensive sales promotion are enabling us to reduce the prices of stock models, as a result of larger production Lower prices, quite obviously, help every unit of the sales organization

ALEXANDER'S SALES AGREEMENT

TO ALEXANDER AIRCRAFT CO.,
COLORADO SPRINGS, COLORADO

In consideration of my being appointed as one of your salesmen I hereby agree that the following is to constitute my entire working agreement without addition or modification unless it be in writing signed by one of your Home Office officials

The only territory in which I may sell your products is as follows

Within that territory I agree to devote my best energy and effort in selling exclusively the airplanes motors accessories, etc for which you are the exclusive sales agents, at the prices and subject to the terms provided by you

You are to allow me to use an Alexander Eaglerock Airplane which I agree to return to you whenever this agreement is terminated in as good condition as when I receive it reasonable wear excepted I will pay all expenses necessary for the upkeep of the plane and keep it in a good state of repair. Should the airplane at any time become damaged or in need of replacements and I do not promptly place it in good repair I hereby authorize you to make any such repairs or replacements and I hereby agree to immediately pay you the cost thereof

On sales made by me you will credit and pay me commissions as follows

CASH SALES. Upon receipt of written order and payment in cash therefor you will pay me 15% thereof immediately as my full commission on the sale This does not apply to motors and extras which carry different discounts On such items you will pay me such commission as you may from time to time announce * * *

I will keep you informed of the names and addresses lines of business and extent of interest of prospects in my territory by weekly reports. You will list my prospects and unless they or any of them are previously listed for some other salesman you will protect them for me for a limited time and will notify me of the length of the protection period At the expiration of this period you may without notice withdraw the protection and sell or allow others to sell the prospect without commission to me I will at no time sell any prospect listed for another salesman or dealer or distributor and if I do so, I agree that I shall receive no commission on such sale

I will make a full report immediately to you of all accidents or other troubles that come to my knowledge occurring to your products whether happening in my territory or not.

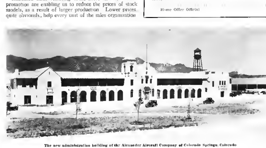
I will faithfully observe the rules and regulations of the Aeronautics Branch of the United States Department of Commerce and of State and Municipal authorities and cooperate with all such authorities in the enforcement of their regulations

I understand that I shall be permitted to carry passengers or goods for hire, and I agree to pay you $2.00 for each hour the motor runs in such service, payments therefor to be made weekly along with my weekly reports. I will keep an accurate account of monies received from any such service and the number of hours the plane is used therein and submit it to you along with my payment therefor * * *

Signed this day of 19

Accepted

Home Office Official



The new administration building of the Alexander Aircraft Company at Colorado Springs, Colorado

OVERHAUL METHODS FOR

OX-5 Engines

Second of a Series of Three Articles About the Service Organization of Parks Air College, Inc.

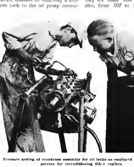
BY JAMES P. WINES

IN THE FIRST ARTICLE, the rigid inspection and maintenance system employed at Parks Air College Inc., East St Louis Ill., for keeping the OX-5 engines used in the training planes in operating condition was discussed in detail The next step in the story is that of the methods used in performing major overhauls on the engines, which account to a great extent for the excellent service that the school is obtaining from these water-cooled power plants

When an engine is brought into the shop for major overhaul, the cylinders, accessories and the lower half of the crankcase are removed The upper half of the case with the crankshaft, connecting rods and the pistons in position, is then placed upside down on a stand and the same test for leaks in the oil circulating system, performed at the end of every 500 hr. of operation, is made This, it will be remembered, consists of attaching a copper tube from a pressure tank to the oil pump connection, and the forcing of two gallons of light oil contained in the tank through the circulating system under a pressure of from 60 to 75 lb By this process the leaks that have developed in the lubrication system at once become apparent

The connecting rods with the pistons attached are then removed, as is the crankshaft. The check plugs are taken out, and the shaft is ground down and honed until it is .010 to .020 in under-size While reducing the size of the shaft to this extent might lead one to believe it would have a tendency to warp in operation, this is not true according to "Murphy" Shedenhelm, service manager of the Parks School, who says that the metal in the shaft of an OX-5 engine is seasoned by the penetration of oil after several hundred hours of usage, and consequently that it is stronger than a new one After grinding and honing, gasoline is forced through the oil passages in the shaft to remove any dirt that may have accumulated, and new check plugs are inserted

While the work on the shaft is in progress, the main bearing caps are checked and new bearing shells installed. These shells are constructed to the old Government specifications by McQuay-Norris, St. Louis, Mo., bearing manufacturer, in so far as materials are concerned, but they are made .050 in. undersize In installing them, also, from .007 to .009 in crimp is left. This is to force the shell snugly into the cap when the nuts on the stud bolts are drawn up in assembling the bearings, which is the next step Each nut, by the way, is punch marked, as is the bearing cap, after the nut has been drawn up to make sure that it will be given the same number of turns in the tests and final assembly



Pressure testing of crankcase assembly for oil leaks as employed in the Parks process for reconditioning OX-5 engines

The bearings of the OX 5 engines overhauled by the Parks service organization are never scraped Mr

Shedenhelm estimates that a bearing surface of only 70 per cent of the total area is all that can possibly be obtained by the scraping method, while the accuracy is increased to from 92 to 95 per cent by line boring. As a consequence, the main bearings are line bored with fly-cutters after they have been tightened. In this, a check is made with the mesh of the timing gears and the depth of the thrust bearing, so that the gear will have the proper clearance and the thrust bearing will not be too tight in either half of the crankcase.

The fly-cutters, of course, will bore bearings of varying dimensions, and in the OX engines they are bored to allow a clearance of .0015 in. It is said that with this clearance a perfect oil film is maintained over the entire bearing surface at all times. The clearance is not large enough to cause the oil pressure to drop below normal, and yet it is not so small that it causes the bearings to heat up and warp. With the .0015 in clearance on the main bearings, an OX crankshaft should spin around three times when given an ordinary blow with a fist. This test is used at the Parks School, although the fit is always checked by the application of Prussian blue.

It is interesting to note that the war-time production thrust bearings are retained in overhauling the Parks engine. However, all bearings of this type are first sent to the Ahlbert Bearing Company in St. Louis for reconditioning. This firm regrinds the ball races and fits oversize balls in them. Mr. Shedenhelm is quite enthusiastic over the work performed by this St. Louis firm, and says that the reworked bearings are much better than new ones.

The next step in the overhaul of the OX engine is the checking of the camshaft bosses in the crankcase. If they are found to be in a roughened condition, they are bored with fly-cutters to from .005 to .030 in. oversize. If the camshaft itself is rough, it is ground just as was the crankshaft. The camshaft bearings, which were mentioned in the first article, are constructed of an alloy of 115 Brinell test hardness. These are machined to a size as to allow a clearance on the shaft of .0015 in. In assembling the camshaft, equal space is allowed on each side between the cam lobes and followers. The position of the shaft is regulated from the forward cam bearing, allowing a clearance of .0025 in. endwise. After installing the camshaft, the crankshaft is placed in position. Oil is applied to the main bearings, and they are tightened. The timing gears are then added, and are checked so that their depth is absolutely correct, allowing for .003 in. back lash on the timing gears and from .012 to .015 in. on the oil pump drive gear.

The connecting rod bearings are fitted with the same crimp and the clearance allowed for the main bearings. In this work, a Storm connecting rod-boring machine and a connecting rod boring tool attachment for the South Bend electric drive bed lathe, which is included in the equipment of the overhaul shop, have proved invaluable. Through the use of these machines, the connecting rod bearings may be bored either with the piston in place or removed. This is important from the standpoint of saving time.

The Parks organization has a very large number of OX-5 engines on hand, which are to be overhauled as rapidly as possible, so that they will be ready as spares for the training planes, so that they may be installed in the Parks open cockpit P-1 biplane, which will soon be placed in production by Parks Aircraft, Inc., and so that the Parks organization may inaugurate an overhaul and exchange service on OX-5 engines, which will be discussed later. It has been found with many of these engines that the bearings are worn, but the pistons and the piston pins are practically new. In cases of this sort, the Storm boring machine is used, since this device will bore

Above—The Storm connecting rod boring machine. The jig permits boring the bearing true with reference to the piston skirt. Left—The South Bend 13 in. swing, 8 ft. bed lathe which is used for several operations in the process

a connecting rod bearing without necessitating the removal of the piston. With this machine, the connecting rod and piston are held in perfect alignment in a jig, while the bearing is bored true with reference to the piston skirt. If for one reason or another, the piston must be detached from the connecting rod, the bearing is bored with the attachment for the lathe.

Oversized pistons are not utilized in the engines overhauled at Parks Air College. In case a piston is worn to such an extent that it cannot be used, or if it is broken, a new piston made by McQuay-Norris to the old Government specifications is substituted. The same thing is true of cylinders. If there is a tendency on the part of a piston to stick, a cylinder may be cut very lightly, but not sufficiently to be termed a regrinding operation. If a cylinder is in such a condition that it needs regrinding, some part of it is usually found to be broken or cracked, so that it must be replaced anyway.

In a case where a piston is serviceable, but the piston pin bosses are worn, the bosses are reamed out sufficiently to "clean up." The reaming is done on a Van Norman reamer drive, making use of a Vaterdliet reamer with an aligning sleeve. In such instances, oversize piston pins are employed. Like the pistons and the cylinders, these are manufactured in accordance with the old rather than the new specifications and are made from .003 to .010 in. larger in diameter than normal, depending upon the requirements. In assembling the piston and the connecting rod, the piston end of the rod is heated with a blow torch until it is dark red, and the pin is inserted through the piston and the rod. The hole for the lock screw is located at the same time by means of a special tool developed by the Parks organization.

It has been found that the application of heat in the assembly operation is much more satisfactory than reaming out the piston-pin hole in the connecting rod would be. If the latter method were employed, and the lock screw were to break, the pin might slip out of position, causing damage to the cylinder wall. The oversize pins used in overhauling the OX engines are soft, so that the application of heat does not cause them to temper down, or become too hard. A hard pin probably would crystallize and break when brought in contact with the hot end of the connecting rod. The soft pins, incidentally, are pushed fits in the pistons at room temperature, providing a means of good lubrication when the engine is in operation. The bearing surface obtained by reaming the piston bosses is said to be about 80 per cent of the total area.

After the piston and the rod have been assembled, the assembly is placed in a Storm connecting rod aligner, which fits on the stand used to hold the Storm connecting rod boring tool. At any rate, the rod aligner corrects any twist or bend in the rod, aligning the rod to the full length of the piston skirt, and thus eliminating the possibility of aligning it to a warped portion. The machine has been shown to be accurate to .0005 in. in tests made at the Parks shop.

The next job is that of fitting the piston rings. Standard Burd compression rings are used, but no oil scraper rings are fitted. Mr. Shedenhelm points out that so long as the connecting-rod bearings are fitted properly, there is no need for oil rings. He says that they reduce the lubrication of the cylinder walls, and for that reason cut down the number of revolutions per minute that it is possible to obtain from an engine. They also cause an engine to "squeak" because of insufficient lubrication, something with which the Parks organization is troubled. Following the fitting of the rings, the connecting rod assemblies are attached to the crankshaft and the test, using the pressure tank and the two gallons of light oil, is again conducted. If any leaks show themselves, the engine is at once disassembled and the faulty work is corrected.

While this portion of the work is in progress, the cylinders are also undergoing overhaul. Of course, they are first examined to determine their fitness for further use. The next step is that of inspecting the valve guides. If worn too much, they are replaced with new Miller guides, otherwise the old guides are reamed out so that they measure $\frac{1}{64}$ in. oversize. In the reaming operation, a Miller jig is used. This tool, which is said to be extremely accurate, is also used in both refacing the old and in installing new valve seats, the next operation, so far as the cylinders are concerned.

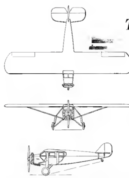
In refacing the seat, the jig is attached so that it is aligned with either the intake or exhaust port, as the case may be, and with the support flange at the top of the cylinder, holding the reamer in the proper position in relation to the seat, so there is no danger of cutting into the water jacket. If the seat has been completely hammered out, the port is bored and threaded, and the new seat is put in. The joint, in a case of this sort, is sealed with a mixture of litharge and glycerine, and the new seat is trued up. Incidentally, the water jackets are tested for leaks before the cylinder is given a final "O.K."

The old valves are used in engines undergoing overhaul if they are found to be in a serviceable condition. They are trued up on the South Bend lathe through the use of a tool post grinder in conjunction with a special valve chuck. If the old valves cannot be trued up by this means, they are replaced with new Jadson valves, which are fabricated of a metal that will not flake the cast iron seat of the OX-5 engines. The process of grinding in the valves, the next step, is said to be of short duration as a result of the accuracy with which the valves themselves are trued up and the accuracy with which the work on the valve seats is done.

Like other parts of the engines, the valve actions are completely disassembled in the overhaul job. The tappet pin holes are reamed out oversize, so that larger pins on the intake and exhaust tappets may be installed. This is to eliminate any side thrust on the valve guides. The hose connections and clamps are always replaced, and the intake pull rod springs and straps are tested and checked for wear. The valve springs, by the way, are always replaced. When this work has been completed, the cylinders are swabbed out with clean oil and are bolted to the crankcase, two paper gaskets that have been soaked in oil being used to seal the joints.

After bolting the cylinders to the crankcase, the gasoline intake manifold is trued up, so that there is no possibility of its cracking when it is attached. The water manifold and the valve action are next installed. The assembly of the water manifold is interesting, since the gasket joints at the water outlets are the only ones on the engines overhauled at the Parks school, which are sealed with shellac. Two gaskets are used to take up any unevenness, as they are the base of the cylinders. Next, the valve clearances are adjusted to .001 in., and the engine is timed by adjusting the cam gear.

The third and concluding article of this series by Mr. Wines will appear in an early issue of Aviation.



THE RYAN B-5 *Brougham*

EMBODYING a number of refinements in design and equipment over the old B-1 and B-3 Models, the new Ryan B-5 Brougham is now in production at the Mahoney-Ryan Aircraft Corporation factory, Anglum, St Louis County, Mo One of these planes already has been used in a record flight made by Miss Marvel Crosson in California. The Ryan B-5 Brougham is powered with the Wright New Whirlwind 300 hp engine, which gives it a high speed of 140 m.p.h., a cruising speed of 120 m.p.h and a service ceiling of 18,000 ft In test flights the plane has taken off in 275 ft and shown a climbing ability of 1,200 ft per min The landing speed is 50 m.p.h.

As in the case of its predecessor, the new Ryan Brougham is a general purpose plane suitable for certain air transport functions private ownership aerial survey, student instruction and other services The standard finish is Lindbergh silver Berryloid pigmented dope with red trimmings Special colors can be provided

The Ryan B-5 Brougham has a wing span of 42 ft 4 in, a length of 28 ft 3 in and an overall height of 9 ft 9 in The weight empty is 2,250 lb, the useful load 1,750 lb, the pay load 1,000 lb and the gross weight loaded is 4,000 lb The airplane is manufactured under Approved Type Certificate No 142

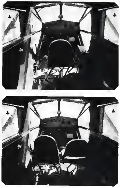
The wing, which is similar to that used in other Ryan models is built in one continuous panel, and has a cord of 7 ft. As in the case of other Ryan wings, the Clark "Y" airfoil section is employed The wing is of constant chord throughout the span Structurally, the wing consists of two spruce spars and 41 full width ribs gusseted with mahogany plywood Drawn steel adjustable tie rods are used in the drag bracing and the bays supporting the two 50 gal gasoline tanks are braced with steel compression members The leading edge is covered with plywood and the wing tip section is faired with balsa wood. Grade A cotton Flightex fabric through stitched by hand is used to cover the wing Six coats of dope three aluminum pigmented and sanded are then applied

The Wright J-6 powered Ryan B 5 Brougham

A Ryan B-5 on floats

The fuselage structure is of welded steel tubing, 1025 S A E specification being used except in the main members which are of chrome molybdenum After the structure is assembled each section is subjected to an internal oil bath under pressure of 80 lb per sq.in. The oil is then drained out leaving a thin protective coating which prevents internal rusting Rust preventives are also used on the outside of the tubing

The cabin is entered through sedan type doors staggered for easy entrance and exit and the interior finishing reflects the tendency in aircraft design to follow the coach work of automobiles The cabin walls are insulated against temperature and sound and provided with large window space and easy opening windows equipped with curtains A well designed lighting system also is provided A harmonious color scheme is also employed throughout and all seats are comfortably upholstered The baggage compartment is accessible from the cabin.



Two photographs showing the method of centering the left seat when that on the right is not in use

An unusual feature is found in the pilot's seat, which is located in a forward part of the cabin. This seat is adjustable sideways, backward and forward and, by a single motion, its position can be changed to the center of the cabin from the left side to permit center control when the seat next to it is not being used. The right hand seat is a collapsable type which folds entirely out of the way and locks against the wall, also by a simple motion. Unusual vision is afforded by the characteristic segment shaped windows in the forward part of the cabin

Complete instrument equipment is provided and includes compass, turn and bank indicator, tachometer, altimeter, oil pressure gage, oil thermometer, oil level gage, air speed indicator The gasoline gages on the wings are easily seen from the pilot seat The compass is located on a spar over the pilot's head to remove it from any possible interference from the ignition system. It is read through a mirror mounted in a convenient position on the instrument board

All control cables and rods run beneath the flooring and none are visible in the cabin. Dual controls for each of the front seats may be had or a center stick if the plane is not used for instruction purpose. The adjustable stabilizer is operated by a lever with fine toothed quadrant at the pilot's left Provision is made for ease of lubrication and inspection of all control wires and other moving parts Water and air tight zipper fastenings enable the fabric to be open at several points

A specially designed exhaust heater is built into the cabin and, according to the manufacturer, a comfortable temperature can be maintained in the cabin even during weather of ten deg. below zero. The heater is so designed that the force of the air traps and compresses air in a chamber around the exhaust. By this means a forced draft of heated air free from gasoline fumes enters the cabin through a floor grating.

Included in the power plant equipment of the plane is a new oil cooler which is installed in the tank located against the fire wall. The tank is honeycombed with small tubes to which a controllable supply of air runs. Olive clamp connections are installed in all oil lines to eliminate possible breakage of the pipes due to vibration. The engine is also equipped with an air cleaner, gasoline strainer and standard factory accessories. An exhaust pipe of the slotted or bayonet type is employed. The plane is equipped with an adjustable Standard Steel propeller. The engine is fitted with an eclipse hand-inertia starter. A booster magneto supplies a hot spark which insures easy starting in cold weather.

Landing gear is of the split axle type equipped with Aerol shock absorber struts as standard equipment. The landing gear axles are of chrome molybdenum steel specially heat treated. Bendix brakes are provided, each being operated independently by a slight pressure on the brake pedal located just beneath the rudder pedals. A tail wheel operating on ball bearings equipped with a pneumatic tire and a shock absorber of the rubber disk and steel spring type also is provided. Flight tests on the new plane mounted on pontoons have recently been successfully completed under the supervision of inspectors from the Department of Commerce. The weight empty with pontoons is 2850 lb., useful load, 1530 lb., pay load, 950 lb., and gross weight, 4100 lb. The specifications as furnished to AVIATION by the manufacturer are as follows:

Type	Braced monoplane
Span	42 ft. 4 in
Chord	7 ft.
Length	28 ft 3 in
Height	9 ft 9 in.
Weight empty	2250 lb
Weight empty (pontoons)	2850 lb
Useful load	1750 lb
Useful load (pontoons)	1530 lb
Pay load	1000 lb
Pay load (pontoons)	950 lb
Gross weight	4000 lb.
Gross weight (pontoons)	4100 lb.
High speed	140 m.p.h.
Cruising speed	120 m.p.h.
Landing speed	50 m.p.h.
Rate of climb	1200 ft. per min.
Service ceiling	18,000 ft.
Take off run	275 ft.
Approved type certificate	No. 142
Engine	Wright Whirlwind J-6, 300 hp. at 2,000 r.p.m.

Above: The zipper opening for examination of the tail wheel shock absorbing mechanism. Below: Preparing the fuselage structure for covering

Ford Motor Company AND AMERICAN AERONAUTIC DEVELOPMENT

By JOHN T. NEVILL

The Company Concentrates on Tri-Engined Planes; Ford Airport is Improved to Accommodate Lighter-Than-Air Craft; The "Air Flivvers"; Second Reliability Tour

THE SUMMER and fall of 1926 saw many progressive changes at Ford Airport. One of the most important of these was signalized by the test flights on the first tri-engined Ford monoplane to reach the test flying stage.

It will be recalled that the first tri-engined craft built by the company was destroyed in the fire which razed the airplane plant on the morning of Jan. 17 that year. The initial plane had been a Liberty-powered type converted into the multi-engined class by the installation of three Wright motors, and some changes in the cockpit. It was called the 3-AT.

Immediately following the fire the second three-engined plane was started in the company's temporary quarters. On June 11, long before the new and present factory building had been completed, this tri-engined plane known as the 4-AT, had been finished and test flown by Maj. R. W. Schroeder, former Army pilot, who, at that time was chief test pilot for the Ford company. This plane was powered by three Wright "Whirlwind" J-4 engines and was equipped to carry eight passengers. Having a wing span greater than that of the tri-engined Fokker in which Commander R. E. Byrd had reached the North Pole the preceding winter, it was the largest commercial airplane in America.

It will also be remembered that the Ford company had already announced plans for confining its production to the multi-engined class. Hardly had tests on the first ship been completed, therefore, before the second three-engined product was well under way.

The Fords' decision to produce only multi-engined craft for the market was actuated by the elder Ford's expressed belief that the multi-engined class holds the greater degree of safety. His production schedule since that time has lined him up, unequivocally, on the multi-engined side of a problem that remains a moot question in the industry today. A single-engined, four-passenger all-metal experimental monoplane was built about a year later, but Mr. Ford never allowed it to be placed in production.

When this decision was put into effect, the company had built a total of eight Liberty-powered craft, according to a statement by William B. Mayo in Ford News of Aug. 7, 1926.

"Four of these," the statement read, "were sold to Florida Airways, Inc. (This sale was in December, 1925). The other four had been in service in the Ford airlines. More planes were in process when the fire wiped out the factory.

"This fire left the Ford Motor Company with only four airplanes to operate two airlines. At once an attempt was made to see how far these planes could be forced, in a matter of hours per day in the air. Loads, originally 1,000 lb. of company freight, were gradually increased to 1,300 lb. or more.

"At first, one round trip to Cleveland and one to Chicago were made daily, but for the last five months the schedule to Cleveland has been increased to two round trips daily. This has been done with only three planes, the fourth being used in experiments in wing curve development. Thus the company has been running three airplane trips per day with only three planes."

"It is usual to have from four to six planes on the ground for each one in the air. In many cases night crews are maintained to service the planes. We are at present, making three round trips each day, operating only two planes—a condition which still maintains. That means that the plane which flies to Cleveland and back in the morning, arriving home about 1 p.m. leaves for Chicago at 3 p.m. The plane which comes over from Chicago in the morning, arriving at noon, takes off after lunch for a round trip to Cleveland. There is no night crew for servicing these planes and we have but two hangar mechanics per engine in service. Our maintenance figures will undoubtedly surprise many in the industry. We are basing them upon scheduled daily performance and we now have an experience (Aug. 1 1926) of 312,736

miles, or twelve and a half times around the world at the equator

"It is our belief that, with the development of motors to keep pace with plane construction we have now developed, twenty hours a day or more is feasible. It is evident that such mileage per day would require night flying.

"Plane designs made in 1920 for the Army were brought forth and various three-engined designs studied with the idea of night flying in mind. Night flying, of course, makes use of the multi-power-plant idea, so that mechanically enforced landings may be avoided. Also, the multi-motored ship permits much better vision than had been obtained on any previous single-motored large plane, and, though it requires more fuel capacity, it provides much greater cargo space."

Mr. Mayo also pointed out in his Ford News statement that, before offering Ford planes to the general public, the company had purposely tried them out on the company's own airlines "to determine just what their capabilities were." This "determining" time lasted over a period of approximately six months, the Ford airlines opening April 13, 1925, the first plane being sold to John Wanamaker, Oct. 8, 1925, and four additional planes to Florida Airways, Inc., December, 1925. These five planes, be it remembered, constitute all of the Liberty-powered aircraft built and sold by Ford. There were, it is true, other companies operating Liberty-engined Ford monoplanes, but such companies bought their planes from the original purchasers. A notable example was the Stout Air Services, Inc. This corporation, organized by William B. Stout as an operating company after he and his stockholders had sold their manufacturing plant to Ford, came into being Sept. 3, 1925. Its first plane was the Liberty-powered Ford re purchased from John Wanamaker. It then re-purchased two of the planes owned by Florida Airways. The fourth plane was a tri-engined machine bought from Ford May 1, 1927. But that is another story.

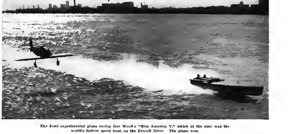
During all of this period the Ford Motor Company was overlooking nothing that, in its belief, would improve the airport. This work, too various to describe in detail, was being carried on almost constantly. Recent developments, however, warrant the inclusion here of one particular project that got under way early in 1926. This was the Ford mooring mast.

The great interest of both Henry and Edsel Ford in lighter-than-air craft is generally known. The Aircraft Development Corporation (now absorbed by the far more powerful and far more diversified Detroit Aircraft Corporation), and the Stout Metal Airplane Company, in fact were in a way twin companies. The early Stout planes and the preliminary work on the present all-metal dirigible being built for the United States Navy, took shape under the same roof. And virtually the same group of men were interested financially in each of the projects, among them Edsel B. Ford and William B. Mayo.

Shortly after completion of the mooring mast in the spring of 1926, Henry Ford invited the Navy Department to fly the dirigible Shenandoah to Dearborn and make fast. The invitation was accepted and the voyage started. That the trip was never completed is history. However, on Sept. 18, 1926, the Army dirigible RS-1, commanded by Col. John A. Paegelow, flew to Detroit from St. Louis, and was the first airship to use the Ford mast.

AMONG OTHER lighter-than-air facilities included at the airport was the installation of piping and outlets for the filling of balloons, in the southeastern section of the field. A number of balloon events, including the start of two Gordon Bennett International balloon races as well as many individual flights, have been made from the airport.

Henry Ford was 63 years old on July 31, 1926. This occasion marked the revelation of another of the manufacturer's experiments—the much discussed "flivver" plane. As in the case of the eight-cylinder airplane motor, Mr. Ford showed it to a group of newspapermen who were in Dearborn getting the usual "birthday interview." Until that time, the flivver plane had remained a rumor. True, for several weeks before it had been seen in test flights about the vicinity of the airport, but, as in the case of all Ford developments, verification of its existence could not be procured.



The Ford experimental plane racing Gar Wood's "Miss America V," which at the time was the world's fastest speed boat, on the Detroit River. The plane won.

One of the early three-engined Ford transport planes used by the Standard Oil Company.

The Ford Motor Company has built and flown two such planes, both being designed and built for the proving in a small way of things that would have cost a great deal of money to do with a larger plane. At no time was any serious consideration given to building such a plane for the market. Both flivver planes were of the single-place, open, low-wing monoplane type and neither was of all-metal construction. The original had a 20-ft. wing span and weighed 320 lb. It was powered by a 25-hp., three-cylinder, Anzani air-cooled motor, and was said to have a high speed of 100 m.p.h. Some of its interesting features, besides its size and performance, include a pneumatic-tired tail wheel, a very wide wheelbase, and a muffler which throttled the exhaust noise to a remarkable degree.

Possibilities indicated by the first flivver plane justified construction of the second one. Although the second plane was slightly larger and heavier than the first, its general appearance was virtually the same. Its most interesting feature, no doubt, was its engine—a two-cylinder, 36-hp., air-cooled engine developed by Ford engineers.

This plane was not completed until late in 1927. Its engine weighed 118 lb. complete, of which 20 lb. was made up by its double ignition system. The width of the motor was 35 in. and its length, 25 in. The cylinders were of composite structure, the heads being made of high strength aluminum castings. Cylinder barrels were of steel, with the upper end threaded into the casting. Dow forged metal, one-fourth the weight of mild steel, but of equal strength, was employed in the pistons, connecting rods being of tubular section steel. The shank of the rod was built in two parts, bored out, and electrically butt-welded together. This, it was claimed, afforded a maximum of strength with a minimum of weight, and revealed something new in connecting rod construction. The crankshaft had a roller bearing and a babbitt-front main bearing, which served as a thrust bearing as well as a medium through which oil was passed through the hollow crankshaft to the connecting rod bearings. A gear case, attached to the front of the cast aluminum crankcase, enclosed the oil pump and valve gears, which operated the valves through enclosed push-rods. Oil was carried in an aluminum container bolted to the bottom of the crankcase. The engine was said to have been run continuously "on the block" for 50 hr.

BUT TO GET BACK to 1926. Aug. 7, that year, saw the start of the second annual Ford airplane reliability tour for the Edsel B. Ford Reliability Trophy. Approximately twenty planes participated, the 2,584-mile route carrying the contestants across the states of Michigan, Illinois, Wisconsin, Minnesota, Iowa, Nebraska, Missouri, Kansas, Indiana, and Ohio. The tour was won by Walter Beech, flying an open cockpit Travel Air biplane, with the late Brice Goldsborough acting as navigator. Although the event proved highly pleasing from a performance standpoint, it was marked by several mishaps in which no one was injured seriously. Probably the most serious of these mishaps involved one of the two Ford planes participating in the tour. Maj. R. W. Schroeder, piloting a tri-engined machine (the first multi-engined craft built and flown by the company), suffered a forced landing near Nova, Ohio, due to a defective propeller on one of the wing engines. This induced such heavy vibration as to tear the engine loose from its frame, which, in turn, tore away a part of the craft's landing gear, and damaged the tip of the propeller on the opposite wing engine, making it necessary to cut the engine. Schroeder, however, skillfully brought the plane down without serious damage to the machine or injury to passengers. The type of propeller used was immediately discontinued and no further trouble of this sort has been experienced.

While the tour was in progress there occurred in Washington an event that has meant a great deal to American aviation. On Aug. 11, 1926, William P. MacCracken became Assistant Secretary of Commerce for Aeronautics.

The seventh of this series of articles by Mr. Nevill will appear in an early issue of AVIATION

INTERESTING FACTS ABOUT THE *Graf Zeppelin*

THE GRAF ZEPPELIN has flown the Atlantic successfully, her fourth crossing, on the first leg of an attempt to circle the globe And in addition to that she has established a new record for the crossing with a mark of 55 hr 24 min Her mark for her previous crossing (October 1928) was 71 hr 10 min and that of the British R 34 in 1919 being 64 hr 13 min The Graf Zeppelin was timed between Lakehurst, N J, and Friedrichshafen while the R 34 was timed between Mineola, L I, and Clifton Ireland.

The giant Zeppelin, pride of Germany and the greatest modern exponent of the lighter-than-air department of aviation, left Lakehurst on August 8 at 12 39 a m, Eastern Daylight Saving Time and arrived at Friedrichshafen Saturday at 7 41 a.m, Eastern Daylight Saving Time, and landed at 8 03 a m The average speed over the 4,200 mi was about 75 m p h (A description of the west-east trip was given in the August 10 issue of AVIATION —Ed)

The five engines in the Graf Zeppelin were the same five which have been in the airship ever since she was built, and were not new installations following the mishaps of the attempted trip to this country in May, as had been reported previously The cause of the engine failures in May—breakdown of the couplings due to inflexibility in the fittings—had been remedied by more elastic couplings which were better able to withstand the strains imposed Bearings had been changed and other adjustments made. The engines were the originals, however, and had run about 800 hr. when the airship landed at Lakehurst August 4

The engines are designed to run between 1,000 and 2,000 hr between major overhauls They are Maybach VL-2 twelve cylinder "Vee" type, weighing 2,450 lb each They are improvements on the Maybachs used in the Los Angeles and develop 600 hp at 1,600 r p m, at sea level as compared to the American airship's engines, which produce 420 hp at 1,400 r p m Better performance is secured partly through increased compression, carburetor alterations and substitution of aluminum pistons

All rotating surfaces with the exception of wrist-pin bushings float on Maybach roller bearings. Direct reversibility of the engines is obtained by the shifting of the cam shaft to change the timing of the valves This replaces previously used reversing gears which were a source of trouble A compressed air starter is used to crank the engine in either direction

Either liquid or gas fuel may be used in the VL-2 The engines are adapted to the latter by the hollowing of the throttle valves of the Maybach carburetors There are four of these for each engine, one for each three cylinders The gas is piped from the container bags to these valves The liquid fuel is introduced through another valve in this gas feed pipe Either liquid or gas fuel may be switched into the engine with loss of only a few seconds and without interrupting the engine's operation or appreciably cutting down its power The gas fuel, being slightly heavier than air feeds by gravity, and its consumption helps lighten the airship automatically to counteract the inevitable seepage of hydrogen The five engines use about 2,600 cu ft of gas fuel per hour or about 195 gal of gasoline per hour

The gas fuel, carried in fourteen of the 30 ballonets is designated as Blau Gas in Germany Its American counterpart is called Ethane They are practically the same as far as function is concerned but differ in derivation The former is a combination of gases obtained by cracking oils at low temperature while the latter is one gas by itself, the result of isolating certain properties from natural gas About 775 000 cu.ft of Ethane were supplied to the Graf Zeppelin by the Union Carbide and Carbon Corporation of Wheeling W Va It was transported to Lakehurst in 2 500 cylinders

APPROXIMATELY 1 000 gal of gasoline and a quantity of oil were furnished by the Tide Water Oil Company When the airship reached this side of the Atlantic it had enough fuel for at least 25 hr more cruising Inasmuch as the trip from Germany to Tokio may be about 600 mi longer than its normal cruising radius of 6,000 mi it is planned to increase the proportion of Blau Gas on account of its comparative lightness and sacrifice some of the usual gasoline load

As AVIATION goes to press it was expected that the Graf Zeppelin would be launched from Friedrichshafen on its world tour Wednesday night August 14 This is the most dangerous part of the long flight on account of the great distance and because of the barren and uncharted regions which must be crossed To increase its cruising range to the limit the crew is eliminating every possible ounce of unnecessary weight

In Tokio the dirigible will be housed in a German hangar which formerly was used for Zeppelin forerunners of the present airship during the war It was turned over to Japan after the war From Japan the airship will be flown northeast across the Pacific, skirting the Aleutian Islands and passing down the west coast of Canada and the United States to Los Angeles

From Los Angeles the dirigible will be flown over what is known as the Texas route to avoid the highest peaks of the Rocky Mountains It will be necessary for the Zeppelin to maintain an altitude of not less than 6,800 ft if it comes through the lowest pass or to fly at about 9 000 ft if it goes over the range The highest the Graf Zeppelin ever has been flown is about 13,000 ft

It is expected that the world flight will be concluded at Lakehurst about September 3

GENERAL NEWS

United Forms Firm; May Add Standard Steel

NEW YORK (N Y)—United Aircraft & Transport Corporation has recently formed Northrup Aviation Corporation to take over the assets of Avion Corporation of Los Angeles, a company organized last year by John K. Northrup, formerly with Lockheed Aircraft Company, to experiment with a new type of flying wing machine Stockholders of Avion Corporation will receive 3,000 shares of United in return for their holdings

The new company will continue experimenting with all-metal planes having no fuselage, but supporting the tail surfaces on two cantilever booms In the meantime, it will manufacture all-metal transport planes of conventional type.

United Aircraft has also arranged the acquisition of Standard Steel Propeller Company, offering one share of its stock for 2½ shares of the stock of the latter company This deal is contingent upon acceptance by 75 per cent of Standard stockholders

Other companies which have recently joined the United group are Sikorsky Aviation Corporation and Stearman Aircraft Company, as previously announced in AVIATION.

Graf Using Pioneer Compass

LAKEHURST (N J)—Following receipt of cable instructions from Friedrichshafen Germany, a Pioneer earth inductor compass has been installed by the engineers of Pioneer Instrument Company, Brooklyn, N Y, in the Graf Zeppelin for its round-the-world flight

Wright Gipsy Price is $1,600

PATERSON (N J)—Price of the Wright Gipsy engine, f o b St Louis, Mo, is given as $1,600 by B G Leighton director of sales and service This price includes standard equipment as follows two Scintilla magnetos, Stromberg carbureter, mounting arms (four alike), tool kit ignition switch, exhaust manifold, engine cowling Both price and standard equipment are subject to change without notice, according to the announcement.

Aluminum Company Working New Foundry

FAIRFIELD (CONN)—Production is now under way at the recently completed foundry of Aluminum Company of America in this city This foundry which has a floor space of approximately four acres is under the management of S K. Becker.

The Fairfield foundry is devoted to the manufacture of castings of aluminum and its alloys and is equipped with the latest type of machinery for production and testing Complete chemical and physical laboratories as well as photo microscopic and X-ray laboratories also are provided.

Among the aircraft companies for whom castings are manufactured at this foundry are, Pratt & Whitney and American Cirrus Engines, Inc.

One of the interesting features of the construction of the Fairfield foundry is the extensive use of aluminum in its construction Hardware, electric fixtures ornamental railings, stair rails and treads are constructed of this metal

Showing the completed body of Aircraft Development Corporation's ZMC-2. Note the position of the control surfaces

Prepare to Test Metal-Clad Airship

Name Kepner to Fly New ZMC-2 in Trials

DETROIT (MICH)—First test flights on the ZMC-2, an all-metal dirigible of radical design constructed for the United States Navy by Detroit Aircraft Corporation, will be made here soon. After having inflated the metal bag with helium gas, the builders now are completing installation of instruments. The flight is to be made from Detroit Aircraft Corporation's Grosse Ile airport, where the engineering work and construction of the ZMC-2 has been going on for several years.

Capt W E Kepner, winner of last year's James Gordon Bennett International Balloon Race, has contracted to pilot the airship on its initial flight Following the preliminary flights the craft will be flown to Lakehurst, N J, where it will be formally turned over to the Navy Department.

Because of the tendency of helium to mix easily with air, the ZMC 2 at first was filled with carbon dioxide After that the non-inflammable helium was injected into the bag, forcing out the carbon dioxide Diffusion tests of the helium are now being made.

Two Whirlwinds for Power

Lieut. Comdr William K. Harrill, senior member of the survey board appointed by the Secretary of the Navy to accompany the ship on its acceptance flights as official observers, has arrived here to give the ZMC-2 a final inspection prior to its first flight, and although Captain Kepner has not yet picked his crew, it is a foregone conclusion that Harrill will be aboard the ZMC-2 when she rises off the ground for the first time

The ZMC 2 is 150 ft long and 52 ft. in diameter giving a fineness ratio of approximately 3 to 1 It will hold 200,000 cu. ft. of gas, and its control car has accommodations for a crew of four The ship will get propulsion from two Wright J-5 engines and is expected to have a high speed of more than 60 m p h with a cruising range of approximately 600 mi

Three distinctly radical departures from conventional lighter-than air craft construction feature the design of the ZMC-2 It is all metal, except for the balloonets within the gas bag by means of which the gas pressure is controlled It is fitted with an entirely new control method having eight fins around its tail and using four of them as rudders and elevators These fins are set 30 ft forward of the tail to increase stability.

(Concluded on next page)

Mercury Taxiing Tests Satisfactory

British Entry Reported To Have Attained 330 M.P.H

ANNAPOLIS (MD.)—As we go to press, Lieut Alford J Williams is preparing to flight test his new seaplane, "Mercury" Results of preliminary taxiing tests, at speeds in excess of 100 m p h, have been pronounced satisfactory, and if, as is hoped Lieutenant Williams succeeds in bettering in tests the present record of 318 m p h, he will take the plane to England for the Schneider cup races at Cowes Sept 7

The London *Daily Mail* reports that the Supermarine S-5, British entry which won the race in 1927, has covered a three mile course at an average speed of 300 m p h, and later reached an estimated speed of 330 m.p.h. Trials of a new racer, the S-3, have also been conducted

The Mercury seaplane is a development of the original racer of the same name built in 1927, which had a high speed of 290 m p h It uses the same 24-cylinder 1,100 hp Packard "X" engine but the intake manifolds and carbureters have been placed inside the vertical "Vees" to give a considerably reduced frontal area allowing a more scientific streamlining of the fuselage of the plane It is said that the engine held in reserve for the Schneider Cup Races may develop 200 hp more than the one used in the tests

Use Float Radiators

Other unique features include float radiators utilizing 80 per cent of the under water area of the floats to cool the engine while the plane is taxiing, before it has reached a speed sufficient to render the special wing radiators sufficient for cooling The fuselage and wings are of plywood, the floats and control surfaces of metal

The Mercury was designed and built in the Naval Aircraft Factory, Philadelphia Navy Yard under the general supervision of Comdr R. D Weverbacher manager Details of design and construction were under the direct personal supervision of John S Koan, aeronautical engineer The money needed for experimenting and building the machine was supplied by The Mercury Flying Corporation a group of patriotic sportsmen under the presidency of Seth Low Among various commercial interests co-operating were Texaco company for fuel and oil, Electric Storage Battery Company for ignition and starting batteries, MacWyte Company for streamline tie rods, Haskelite Company for plywood B & G Spark Plug Corporation, Aluminum Company of America Stromberg Carburetor Company, Scintilla Magneto Company

Characteristics and statistics regarding the Mercury, as given out by the Navy Department, are as follows

Type—Twin float monoplane seaplane
Engine—Packard "X," 24 cylinder rated at 1 100 hp
Wings—Section N.A.C.A. M-6, with smooth surface skin radiator
Weight—Approximately 4 400 lb
High speed in excess of 300 m p h
Low speed—100 m p h
Wing loading—in excess of 30 lb sq ft
Power loading (calculated on basis of 1 100 hp and 4 400 lb weight) 4 lb. hp.
Fuel capacity—90 gal
Oil capacity—9 gal

Lieut Al Williams slipping into the cockpit of the "Mercury" for a taxiing test The fine streamlining of America's Schneider entry is apparent

Prepare to Test Flight Metal-Clad Dirigible

(Concluded from Page 343)

Finally, it has an unusually low ratio of fineness for an airship of its size

The ZMC-2 was not designed to be a craft with any commercial possibilities Rather, it was built purely as an experiment and as having a considerable number of military, naval and scientific uses. However, it is claimed by the builders that the gauge and strength of the alclad going into it are such that the same type of craft can be produced several times the ZMC-2's size without increasing the width or weight of the metal per square inch The skin's gauge is 008 in

The Aircraft Development Corporation, builders of the ship, was used as a nucleus around which the $20 000 000 Detroit Aircraft Corporation was organized here recently The ZMC 2 cost approximately $1,150 000 to build and is going to the Navy for $300 000

New Merger Being Completed

CINCINNATI (OHIO)—A merger of the Metal Aircraft Corporation Cincinnati the Johnson Airplane Supply Company Dayton and a Wichita airplane manufacturing and supply company involving about $5,000,000 is being consummated it was reported in Cincinnati on Aug 8 Powel Crosley Jr radio manufacturer, and the Fleischmann interests will hold a large part of the stock in the new enterprise it was stated E A Johnson head of the Johnson Airplane Supply Company Dayton, was said to have confirmed the proposed merger and also will hold a large interest in the combine

Eastern to Produce Messerschmitt Planes

PAWTUCKET (R I)—Messerschmitt all-metal planes will be manufactured in America by Eastern Aircraft Corporation, which was formed here recently with Ray C. Van Arsdale as president. The new corporation has purchased the plant of Pressed Metal Company, near the What Cheer Airport, Pawtucket, and will start production immediately

These machines are designed by William Messerschmitt, German glider expert and have been made in Germany for the past four years by Bavarian Aircraft Corporation. Three types are scheduled for immediate production the B F W M 26, a three-passenger cabin plane the M 18 a seven-passenger cabin plane, and the small Messerschmitt training plane The latter model has received extensive publicity because of its use by Miss Thea Rasche The two cabin planes are of the high wing cantilever monoplane type. American engines will be used

Rearrangement of the plant has been carried out under the direction of officials from Bavarian Aircraft Corporation, and German engineers will supervise production No experimental work will be done in America since the German firm guarantees to send over designs which will meet Department of Commerce specifications for approved types Accordingly models built here will be changed only after new planes have been developed in Germany

Stinson Reports July Orders

DETROIT (MICH)—Stinson Aircraft Corporation during July received orders for $345 828 worth of airplanes, according to figures just released by the company A total of $177,116 worth of airplanes were shipped during the month the statement said. Stinson sales during the first seven months of 1929 according to the figures totaled $814 917.60 a gain of $139 667 88 over the first seven months of 1928

To Produce Farman Planes in This Country

NEW YORK, (N Y)—Farman Brothers of France, who now own one of the oldest and largest airplane manufacturing plants in the world and operate an extensive airline system in Europe, will enter the American aviation field with the formation of an American corporation having the financial support of a prominent New York and Philadelphia banking group, it is announced

The American company represents the first time that outside capital has been invited to participate in the enterprises in which the Farman Brothers are interested The new project, it was pointed out, is being financed privately and no public offering of securities will be made at this time

Negotiations leading to the organization of the American company were carried on between Harrison R Tucker, of Tulsa, Okla representing the Farman Brothers in the United States, and representatives of the bankers affiliated with the project

The American corporation plans to start production of Farman planes at a plant to be located near Wheeling, West Va, and an assembly plant, which will serve as a demonstration and sales base, is contemplated near New York or Philadelphia Tentative arrangements have been made to locate this on the Central Airport at Camden, N J

According to the official announcement, the American company will have "the exclusive right in the United States to all of the Farman airplane patents present and future It is proposed to use American built engines

"Our present plan is to build only the large planes which have proven most successful on the European routes," Mr Tucker continued "Farman Brothers' extensive experience in operation of air passenger transport lines has enabled them to design large planes, particularly adapted for the needs of such service."

Approve Three More Planes

WASHINGTON (D C)—During the week ending Aug 10, three more approved type certificates for planes were issued According to model, type, power plant, useful load, and gross weight, they are as follows 191—Curtiss Fledgling, two-place open biplane, Challenger, 696 lb, 2,686 lb; 192—Metal Aircraft G-2 W Flamingo, eight-place cabin monoplane, 450 hp Wasp, 2,430 lb., 5 800 lb 193—Curtiss Condor Co twenty-one place cabin biplane, two 600 hp Conquerors, 6,326 lb. 17 678 lb

Occupy Connecticut's Building

HARTFORD (CONN)—Connecticut's state department of aeronautics has moved into its new enlarged administration building at Brainard Field The appropriation for the structure was voted by the General Assembly

Command-Aire Plant for Chile

LITTLE ROCK (ARK)—Command-Aire, Inc, will open a branch plant at Santiago, Chile, about Jan. 1, 1930, where planes built in this city will be assembled, according to an announcement by Pres Robert B Snowden Jr The new plant has an order for 36 planes to be delivered to the Chilean Government during the first year of its operation.

Order Arrow Sports For "Rent-A-Plane" Use

LINCOLN (NEB)—Arrow Aircraft & Motors Corporation, this city, announces receipt of an order from the Saunders Drive-It-Yourself system for 100 Arrow Sports, the first ten to be delivered to the Saunders system headquarters at Kansas City The cost of these machines will be more than $350,000

The Saunders system plans to enter the "rent-a plane" field with craft available at each of the 59 cities where the Saunders system now conducts auto renting agencies The rented planes it is believed, will be popular with fliers wishing to get in requisite time for the higher licenses

The first planes delivered by the Arrow company will be powered with LeBlond 60 hp engines, while some of the later craft will probably be Kinner powered The Arrow with the 60 hp power plant has a top speed of 105 m p.h It is a two-place single-cockpit biplane with a span of 25 ft 6 in, a height of 6 ft 11 in, and a length overall of 19 ft 2 in.

Top-speed production is now getting under way at the Arrow plant, and delivery of six of the planes for the Saunders system will be made immediately according to F Pace Woods, sales manager and vice-president

Skelly Oil for Nebraska Tour

OMAHA (NEB)—Skelly Oil Company's offer to furnish all the oil and gasoline for the Nebraska air tour in September has been accepted by the tour committee it is announced here Meals and lodging will be supplied by the towns on the route A committee of four which is to have charge of the tour is announced by Amos Thomas chairman of the aerial transportation committee of the Omaha Chamber of Commerce, which is sponsoring the tour Sam Houser is chairman and other members are J T Stewart 2nd Maj H J Houghland Army officer for this corps area, and L. C Thoelecke, of the National Aeronautical Association

New Standard Tour Completed

PATERSON (N J)—George Daws, sales manager of New Standard Aircraft Corporation this city, has returned from a thirteen-state demonstration tour through the South flying the firm's five-place Whirlwind-powered machine

National Traffic Meeting Planned

Operators Will Gather At Kansas City Sept. 16-18

NEW YORK (N Y)—Plans for a national air traffic conference in Kansas City, Mo Sept, 16-18, have been announced by the Aeronautical Chamber of Commerce Traffic executives of all air transport companies will be brought together for the first time to discuss traffic problems, including rates, consolidated ticket offices, baggage handling, advertising, and publicity George M Lord of Western Air Express, has been appointed chairman of the arrangements committee

"The development of air passenger travel in the United States has been so rapid that the executives of the air transport companies have had little opportunity to get together for a common solution of their problems," Mr Lord said

The morning of the first day, Sept 16 will be devoted to registration and organization Col. L. H Brittin, vice-president of Northwest Airways, has been appointed chairman of the opening session Maj Gen J J O'Ryan, president of Colonial Air Transport Inc, and Lou E Holland, executive manager of the Kansas City Chamber of Commerce, will be chairmen respectively of the Sept. 17 morning and afternoon conferences C W H Smith, general traffic manager of Western Air Express, and Stanley E Knauss, general manager of Stout Air Services will be chairmen of the Sept. 18 sessions The conference will close with a banquet on the evening of the last day, at which Col Paul Henderson, vice-president of Transcontinental Air Transport, Inc, will be toastmaster.

Mr Lord was appointed chairman of the arrangements committee for the conference by Frederick B Rentschler, president of the Aeronautical Chamber of Commerce The other members of the arrangements committee appointed by Mr Rentschler are: J M Eaton, traffic manager, Pan American Airways, Inc, R W Ireland, traffic manager, National Air Transport, Inc., W A Patterson, Boeing Air Transport, Inc., T B Clement Transcontinental Air Transport, Inc, W T Varney, Varney Air Lines Inc, and H I McNally, Universal Air Lines Inc

Canadian Clubs Band

TORONTO (ONT)—With the approval of officials of practically every flying club in Canada, a coast-to-coast organization has been formed with the avowed purpose of stimulating civilian flying throughout the Dominion and of providing a central body having control over the flying activities of all the clubs The first annual meeting of this association will be held at Fort William Nov 1

State Aeronautic Legislation Grows

Pass 106 *of* 250 *Bills Introduced in* 1928-1929

NEW YORK (N. Y.)—Legislation on aviation subjects was plentiful during 1928-29 sessions of state legislatures according to statistics furnished by Prof Harry J Freeman of New York University Law School, head of the legal and legislative research service of the Aeronautical Chamber of Commerce Of the 250 bills introduced, 106 were enacted 65 defeated, and 79 either pending or action on them is unavailable

Most of the acts introduced were general or miscellaneous in character, but 71 were intended to regulate or license aircraft or pilots and 35 authorized the establishment maintenance and regulation of airports Florida, Minnesota New York and Connecticut were most active on this subject, while only seven states failed to enact aviation legislation of some kind, and five of these did not have legislatures in session

California, New Jersey New York, Wisconsin and Illinois authorized temporary commissions to study aviation, while Michigan authorized a state board of aviation, and in New Jersey such a bill was pending Rhode Island has a state board to supervise the establishment of airports. And of special interest to transport companies were statutes enacted in Michigan and Illinois conferring authority upon the railroad companies to carry passengers by airplane. In Wisconsin such a bill was pending, and in Missouri one was defeated.

Unification Needed

In summing up Professor Freeman emphasizes the fact that continued enactment of uncoordinated legislation to regulate aviation by the separate states may result in a dangerously chaotic condition for the air transport industry, although there has been a commendable uniformity in the laws passed this year He recommends the establishment in each state of an authoritative source of information for the use of other states, and further recommends the continuation of the efforts of the Aeronautical Chamber of Commerce in collecting data on aviation law from all states and acting as a clearing house in the interests of legislators manufacturers editors and the general public

Among other laws passed or considered were enactments in Michigan, Iowa and New Jersey relating to aero insurance. Michigan passed a bill taxing gasoline consumed by aircraft while such a bill was defeated in California, and a bill to refund the tax on gasoline used by airplanes was vetoed after it had passed the legislature of Ohio Michigan also authorized mapping certain parts of the state by aerial photography and such authorization was being considered at the time of this report by the legislature in Wisconsin California specifically included aircraft in a quarantine regulation to prevent the introduction of agricultural pests into the state

Dropped Cigars Prove a Menace

WASHINGTON (D. C.)—Forest or grass fires may be caused by lighted cigarette or cigar butts thrown from airplanes at heights up to at least 1,000 ft., as shown by recent tests made by the Forest Service. Four out of six cigarettes thrown from a plane were still burning when recovered, and five out of five cigar-ends were still burning As a result of the experiment the Department of Agriculture may ask Congress to pass a law to prevent the throwing of lighted butts from airplanes, and requiring transport companies to provide convenient receptacles for them

To Begin Prodnetion Of Vari-Camber Dares

DETROIT (MICH)—Dare Airplane Company, holder of a basic patent for changing the camber of an airplane wing in flight recently leased 10,000 sq ft of floor space on West Fort St, here, and announced an immediate production program calling for fourteen planes

The first craft completed, the announcement stated, will be entered in the Guggenheim safety competition to take place in New York This will be a special open-cockpit job The remaining thirteen are to be of a standard cabin, all-metal type for demonstration, training and sales purposes.

It was also announced that Canadian Dare company is now in the process of formation

Company officials have announced their intention of "carrying on," despite a recent unfortunate accident met by the first model of their revolutionary type craft which cost the lives of Melvin E Dare, president of the company, and Sligh W Brown test pilot

Bromley to Try Again

TACOMA (WASH)—Harold Bromley has left for Burbank Calif., where he will have his low-wing Lockheed "City of Tacoma" which was damaged in an attempt to take off for the Orient, rebuilt. As soon as it is ready he will return to Tacoma for load lift, radio, navigation, and engine tests, after which he will again attempt the Tacoma to Tokio trip The plane will be rechristened "Greater Tacoma"

Gray Goose and North Shore Companies Sold

CHICAGO (ILL.)—Announcement is made at the office of United Aviation Corporation, this city, that the sale of Gray Goose Airlines, Inc, and North Shore Airport Company to Chicago Air Service, Inc, has been completed by the delivery to the latter firm of the entire capital stock of both companies. The consideration received by United was not stated but it is understood to be approximately $650,000, partly in cash and partly in securities

Officers of Air Investors Inc were instrumental in negotiating the sales of these two properties for United Aviation Corporation This firm represented United Aviation Corporation in completing the transaction

Gray Goose Airlines has been operating for nearly two years at the Chicago Municipal Airport where it owns two large hangars from which it conducts a sightseeing, taxi, and school business North Shore Airport Company recently completed its airport near Glencoe Ill, in the heart of the wealthy suburban district, north of Chicago A hangar with storage space 100x120 ft. has just been completed The administration building combines the offices of the company with sales rooms for flying equipment instruction and locker rooms for pupils, and restaurant facilities The upper floor and tower have been rented to the Petruska Club, which has been the center of activity for Chicago North Shore society this summer North Shore Airport Company is also engaged in sightseeing, taxi, and schooling activities

Chicago Air Service, Inc, has been financed to operate various aviation activities in and near Chicago by a prominent group of Chicago bankers It has total assets of $950,000

Travel Air to Curtiss-Wright

WICHITA (KAN)—Travel Air Manufacturing Company will become the twelfth unit of the Curtiss-Wright Corporation according to an announcement sent out recently to the stockholders Holders of the 100,000 shares of Travel Air stock outstanding will receive in exchange 175,000 shares of common stock in Curtiss-Wright Corporation Production of planes at the Travel Air factory grew from 46 in 1926, when the company was organized, to 532 last year, and the output for 1929 is expected to reach 1,000 Walter H Beech who won the Ford Reliability Tour in 1925 and 1926, is president of Travel Air

Enlarging Seemless Tube Firm

SHELBY (OHIO)—Ohio Seamless Tube Company, this city, is building an addition to its plant that will increase its capacity 40 per cent Pres A C Morse states that orders for specialized tube products from airplane manufacturers are increasing

Schools and Colleges

Cape Cod Glider School announces that John Perkins, formerly of the Massachusetts Institute of Technology Aviation R O T C is the first to qualify for the school's glider rating

University of Nebraska has set up a new testing laboratory with seven aircraft engines, a small single-seater plane, and a number of aeronautical instruments as equipment

Coyne Electrical School Chicago, Ill has established a department of Aviation Electricity

Braniff-Universal Aviation School, Oklahoma City, Okla, is giving a night executive class covering all phases of the subject including publicity and advertising

Boeing School of Aeronautics Oakland, Calif, has added a Master Mechanics' course offering 792 hr of preparation in technical and business subjects pertinent to airplane and engine manufacturing repair and maintenance

Air Investors Reports Net

NEW YORK (N. Y.)—Air Investors, Inc., reports a net income of $285,566 30 during the first six months of 1929 from investments and loans totalling $4 570-204 07 There are now outstanding 88-667 shares of convertible preference stock, of 250 000 authorized and 162-666 shares of common stock, of 1,500,-000 authorized Thirty per cent of the company's investments are in transport and affiliated operations 29 per cent in industries allied to aviation and smaller percentages in airports, aircraft manufacturing, engines and accessories As a result of this favorable showing the company has decided to organize a new aviation investment corporation in the Middle West which will be affiliated with but independent of, the present company

Kansas City Show Unsanctioned

NEW YORK (N. Y.)—Sanction for the International Air Circus Exposition and Pilots Reunion which will be held in Kansas City Sept 21-29 has been withheld by the Aeronautical Chamber of Commerce in a telegram made public by Charles L Lawrance, chairman of the chamber's show committee. Mr Lawrance explains this action as being in line with the established policy of the Chamber of Commerce not to endorse shows which are primarily for the benefit of private promoters Sanction has been given to a major aircraft show to be held under the auspices of the Kansas City Chamber of Commerce, for which no date has been announced

To Begin Hurricane Plant

HOUSTON (TEX)—Hurricane Motor Company, Inc of which Alexander Clark, 2103 Walker St, is president, is about to begin construction of a $300 000 plant here

Devises Steel Hangar Method

LOS ANGELES (CALIF)—Announcement is made by the Lawrence Company, this city, of a new method for fabrication of steel aircraft hangars and for the application of covering sheeting This process makes it possible to take the building apart quickly and re-erect it The portable feature is believed of importance because airport equipment is often moved or rearranged The chief feature of the Lawrence method is a small cam pin which locks sheeting to the side wall or roof truss flanges.

Minnesota Tour Under Way

MINNEAPOLIS (MINN)—Eleven airplanes are now touring Minnesota on the first all-Minnesota air tour which started from Wold-Chamberlain Field Aug 9 Schedule of the tour is Faribault, Aug 9 Albert Lea Aug 10 Austin, Aug 11, Owatonna, Aug 12 and 13 Fairmont Aug 14, Worthington Aug 15 Luverne Aug 16 Canby, Aug 17 and 18, Moorhead Aug 19, Glenwood Aug 20 Wheaton, Aug 21, and St Cloud Aug 22 Pilots participating include Joe Westover and Delmar Snyder of Universal Air Lines Carl Leuthi, C B Stern and Harry Baker all of Great Northern Aviation Corporation Ben Williams Thorwald ("Thunder") Johnson Webb Fowler, Bruce Cross, Archie Krueger and Roy Bouchard

On Tour in West With Bellanca

SAN FRANCISCO (CALIF)—Making demonstration flights in seventeen cities Alfred D Chandler, sales manager and treasurer of Bellanca Aircraft Corporation, New Castle Del, has arrived here in the course of a transcontinental sales tour in a Bellanca stock model CH-300, piloted by Robert A. Nagle In all the plane has been flown 109 hr, including exhibitions of performance under difficult conditions Among the cities visited were Youngstown Cleveland, Dayton Cincinnati, Ohio, Kansas City Mo Tulsa, Ponca City, Okla, North Platte, Grand Island, Omaha, Neb, Cheyenne Wyo; Denver Colorado Springs, Colo; Albuquerque N M; Phoenix Ariz; Los Angeles San Diego Calif.

Report Consolidated Orders

NEW YORK (N. Y.)—Two orders for aircraft instruments amounting to more than $61 000 have just been received by Consolidated Instrument Company of America Inc. from Parks Aircraft Company, East St Louis Mo and Cardinal Aircraft Company aviation division of St Louis Car Company The Parks company has contracted for special custom-built instrument boards for 500 planes while the Cardinal order calls for complete aircraft instrument panels to be installed in 100 two-place monoplanes, on which this company is now in production.

New Firms Announced

Aero Coast Express, Inc, 5985 Drexel Road, Philadelphia Pa, capital 20,000 shares no par value stock, by George A Huhn, III, president; Frank Mills, vice-president, Alan R Young secretary, Clark F Huhn, treasurer, to offer a complete flying service with seaplanes flying boats and amphibions, a ground and flying school, and to manufacture pontoons cowlings, fuel tanks etc, at Essington Pa

Long Branch Airways, Inc, 120 Broadway, New York City capital 1,000 shares no par value stock by Thomas F Heffernan, James J Heffernan and Karl A. Kopetzky, to operate and deal in aircraft.

Flying and Service, Montreal, Canada, capital $112,500

Chagnkart International Aviation Corporation, 521 Fifth Ave, New York, N Y., previously listed incorrectly as the Chagnard International Aviation Corporation

The Aero-Marine Taxi Company Tacoma Wash, capital $10 000, by Arthur O Berg and Harold Sheard

Soaring Plane Corporation, Los Angeles, Calif, capital $500,000 by John Bruce, Thomas C Eddy and Luke J McNamee.

California Aviation Club, Ltd, Los Angeles Calif, capital $2,000 000 by H J Barneson George E Reed and Walter E Burke, all of Los Angeles

Continental Aero Corporation Ltd, Montreal Canada capital 20,000 class "A" shares of $25 par value and 40 000 shares of class "B" stock of no par value

Janney Aircraft and Boats Company Ltd Kingston, Ont; capital 20-000 shares of $10 par value preferred stock and 200 000 shares of no par value common stock

Show Irving Chutes on Tour

ROOSEVELT FIELD (L. I., N. Y.)—With Miss Elinor Smith piloting a new J-6 powered Bellanca monoplane, a "national safety flying tour" was started here recently under the sponsorship of Col Louis J Campbell of Hornblower and Weeks and chairman of the Irving Air Chute Company The latter firm's parachutes will be demonstrated at each city on the route

Six More Fairchilds to Chile

FARMINGDALE (L. I., N. Y.)—Six more Fairchild planes have been shipped by Fairchild Aviation Corporation to Santiago Chile for use in the Santiago Arica mail service. Lieut Juan del Villar, of the Chilean air force, made a trip to the factory here and tested the machines before they were packed for shipment via the Grace lines

Institute of Politics Considers Aviation

Latin American Air Transport Discussed

WILLIAMSTOWN (MASS)—For the first time in the eight years of the Institute's existence, commercial aviation is playing a prominent part in the current session of the Institute of Politics here. The principal features of the first of a group of conferences on the economic and commercial development of Latin America, opened on Aug. 5, was a discussion of air transport possibilities in South and Central America. Prepared papers to introduce a discussion were presented by Harry F. Guggenheim, President of the Daniel Guggenheim Fund for the Promotion of Aeronautics, and by Edward P. Warner, Editor of AVIATION.

Mr. Guggenheim predicted an enormous expansion of air transport between the United States and the countries to the south. He pointed out, for example, that the time required for passage from Washington to the capital of Chile could be reduced from a minimum of 22 days by the fastest surface transportation to less than five days by air, even though no night flying were done. Managua, the capital of Nicaragua, also requiring some three weeks of travel from the capital of the United States by means existing before the opening of the Pan American Airways line, can be brought within 36 hr. by daytime flying at 100 m.p.h.

Predicts New Trade Routes

Mr. Guggenheim further predicted that the economic development of Latin America would be largely governed by the influence of air transport, and that new trade routes and new commercial centers would be created. He laid special emphasis on the value of the airplane for carrying perishable products from one part of the western hemisphere to another, summing up in the conclusion "the airplane bringing fresh, uncanned products from one section of our continents to another will be an accomplished fact in the not distant future."

Mr. Warner's address dealt more specifically with the political element in Latin American air transport. He pointed out that there has not been up to the present time a single airline in any of the Latin American countries which has been promoted, financed and managed without extensive European or North American assistance. The nearest approach to independence of external assistance, he declared, was furnished by the Peruvian Navy Line inaugurated under the direction of Lieutenant Grow—formerly of the United States Naval Mission to Peru, who resigned his commission in his own Navy to become a captain in the naval service of the Peruvian Government.

Mr. Warner pointed out the serious difficulties in the way of international operations, where no general international agreement protecting the freedom of air navigation exists, and urged the vital importance of either securing the ratification of the existing Pan American Air Navigation Convention drawn up at Havana a year and a half ago or replacing it with something else. The speaker declared further that the United States Navy Department had declined to permit of any commercial activity, either direct or indirect, by its naval missions to South American countries, and that the direct support which this government has been able to give to American industrial endeavors in that region had been limited to the dispatch by the Department of Commerce of a trade commissioner for aeronautics to cover the entire Latin American area, and to the individual initiative of Lieutenant Grow. Summarizing the history of the participation of the United States Government in Latin American aeronautical development, Mr. Warner indicated that while considerable amounts of money and of effort of diplomatic and executive officials had already been expended on encouraging the penetration of airlines under the flag of the United States, a steady continuance of such support on a liberal scale would be necessary if this country were to continue to hold a place.

New Fokker Franchise to Aero

LOS ANGELES (CALIF.)—Territory covered by the franchise now held by Aero Corporation of California, for the sale of Fokker aircraft has been revised. The distributor's contract, which formerly covered only single-engined Fokkers in California and Arizona, now has been revised to include that part of California lying south of and including the counties of San Luis Obispo, Kern and Inyo; all of Arizona and New Mexico, and that part of Texas west of and including the counties of Dawson, Midland, Martin, Upton, Pascos, Terrell and Gaines. The new franchise also grants the sale and distribution of tri-engined Fokkers.

Alaskan Firm to Aviation Corp.

NOME (ALASKA)—Negotiations for the consolidation of Bennett Rodebaugh Company, Fairbanks, Alaska, and the Wien Alaska Airways, of Nome and Fairbanks, into Alaska Airways, Inc., has been completed, according to an announcement by Carl Ben Eielson, who is acting as agent for The Aviation Corporation, which will hold Alaska Airways, Inc., as a subsidiary. Two new Standard D-25's, powered with Whirlwind engines, are being shipped from New Standard Aircraft Corporation, Paterson, N. J., to Captain Eielson.

Veteran Mechanics to Gather

INDIANAPOLIS (IND.)—Approximately twelve hundred former service men will meet here Aug. 22-24 at the fourth annual reunion of the Veterans' Association of the 2d Regiment Air Service Mechanics.

Fairchild Plans Nine-State Tour

FARMINGDALE (L. I., N. Y.)—A flying tour of approximately 3,500 mi. to be taken in the interest of aircraft distribution and touching nine different states, the majority of which are in the Mid-West and West, with stops in thirteen principal cities, will soon be undertaken by a party from Fairchild Aviation Corporation's flying field here. The party will include Ralph G. Lockwood, executive engineer of Fairchild Airplane Manufacturing Company, Mrs. Lockwood, Paul Couchman, a friend of Mr. Lockwood, and William B. Leslie, Jr., of Fairchild. The craft will be a Fairchild "71" seven-passenger cabin monoplane. Mr. Lockwood will be pilot. Stops will include Buffalo, Detroit, Cincinnati, Dayton, Indianapolis, St. Louis, Kansas City, Wichita, Tulsa, Oklahoma City, Fort Worth, Chicago and Cleveland.

Who Will Replace MacCracken?

WASHINGTON, (D. C.)—The return of W. P. MacCracken, Jr., to Washington on Aug. 13 was heralded as the signal for putting in motion the official machinery for naming his successor as Assistant Secretary of Commerce for Aeronautics. In view of the pending appointment, significance was attached to Colonel Lindbergh's visit to the President's hunting and fishing lodge on the Rapidan over the weekend of Aug. 10. It is generally believed that the position is open to the flying Colonel if he desires to accept it. The most likely name for the position, however, is believed to be that of Maj. Clarence M. Young, Director of the Aeronautics Branch of the Commerce Department. The name of Leighton W. Rogers of the foreign aeronautical section also is being mentioned.

Eclipse Firm Incorporated

EAST ORANGE (N. J.)—Eclipse Machine Company, producing a line of starters for aircraft, engine driven generators both for battery charging and radio, and other aircraft equipment, has been incoporated as Eclipse Aviation Corporation. It will continue to operate as a subsidiary unit of Bendix Aviation Corporation, which makes the announcement. Equipment manufactured at the East Orange plant is used on planes in the United States naval and military services and on many commercial and transport planes. In addition to its present manufacturing activities, Eclipse Aviation Corporation is developing other aeronautical devices.

Would Rate California Schools

LOS ANGELES (CALIF.)—Officials of the California Development Association have launched a campaign to have all aviation schools in the state officially examined for a rating by the Department of Commerce. The step is being taken in order to reduce the hazards of student flying.

BRIEFLY

During the last three weeks of July 203 passengers on regular transport lines took off and 223 landed at Port Columbus, Ohio.

Air traffic rules recommended by the Aeronautics Branch have been adopted by the Salt Lake City airport.

Work on the Buffalo-Albany airway has been delayed on account of a misunderstanding over work alloted certain contractors.

A total of 157 student pilots enrolled with three flying schools at Candler Field Aviation, Atlanta, Ga., are distributed as follows: Texas Air Transport, 52, Pitcairn Aviation, 41 and Beeler Blevins, 64.

Small cakes of Camay soap are being supplied to Transcontinental Air Transport planes by the Procter & Gamble Company in wrappers marked with the airline's monogram.

Atlantic Airways, Ltd., of St. John, has received a Moth Coupe, its second plane, and has ordered a Curtiss-Robin equipped with floats.

An airplane ticket office has been opened in the lobby of the Hotel Lassen, Wichita, Kan., in charge of Mrs. Madeline Deam Ingals.

About 555 passengers departed and 435 arrived at the Oakland, Calif., Municipal Airport during July on regular transport line planes.

Planes of the Boeing System are flying about 4,600 mi. each night. This figure is more than five times as much as is being flown by the German Luft Hansa system.

Colonial Air Transport made a new company record in July by flying 11,948 lb. of mail, an increase of 1,121 lb. over the June record. Colonial Western Airways showed a slight increase.

The cost of holding the recent Oklahoma City airport bond election for $425,000 was placed at $7,000, at the rate of $2.00 per vote cast.

An American Eagle powered with a Wright Whirlwind has been bought by the Alabama Forestry Commission for state forestry work.

Boeing System announces that pilots of the Pacific Air Transport Company are now able to communicate over planes ground system on the Seattle-Los Angeles route.

Southern Air Transport's fourth short-wave radio station is being completed in Houston, Tex.

National Parks Airways, Inc., announced at the close of its first year of flying under government mail contract, that its planes had flown 415,000 mi., carrying 61,870 lb. of mail and 870 paid passengers, on the route between Salt Lake City and Great Falls, Mont., with stops at Ogden, Pocatello, Butte and Helena.

Yellow Air Cab Company has been formed in Wichita, Kan., with Gary E. Prebensen as president. It is announced that the company will soon extend its activities to other cities.

Teletype service has been installed in the office of Herbert H. Mills, airport manager of Brainard Field, Hartford, Conn.

Forty per cent of passengers taking Western Air Express from Los Angeles to Kansas City in July made through reservations to eastern points, according to C. W. H. Smith, general traffic manager. Western Air Express now has working agreements with 22 railroads for the cohandling of passengers and ticket sales. The company's planes flew 88,040 mi. over this route during the month, with an on-time record of 90 per cent.

Production of twenty-passenger Burnelli monoplanes will be started at the Aeromarine Klemm factory at Keyport, N. J., soon. Orders for fifteen of these planes have already been received, it is said.

Miss Phoebe Omlie, Moline, Ill., reached only 17,467 ft. in her attempt to break the women's altitude record last June, according to calibration of her barograph by the Bureau of Standards. The record of 20,270 ft. made by Louise Thaden, Oakland, Calif., therefore still stands.

It is reported that General Motors Corporation is negotiating for the acquisition of New Standard Aircraft Corporation, Paterson, N. J.

A consolidated air passenger bureau has been opened at 339 Wabasha St., St. Paul, Minn., under the direction of Northwest Airways, Inc.

Pickwick's Latin-American Air Transport, Inc., has purchased eight Ryan Brougham six-place cabin monoplanes for use on its line between Los Angeles and Guatemala City. The line was opened July 29.

Representatives Named

ARCO—Chicago Aero Sales corporation, Chicago, Ill., for Indiana, Illinois, Wisconsin and northern peninsula of Michigan. Oburg-Prentice Corporation, Pittsburgh, Pa., for Pennsylvania and West Virginia. Ohio Air Transport Company, Inc., Youngstown, Ohio, for Ohio. Jack Adamson and Sam Kunier, Covington, Ky., for Kentucky. Matthewson Airways, Inc., Detroit, Mich., for southern peninsula of Michigan, including Detroit. Simons Aircraft division of Steel Inc., Los Angeles, Calif., for remainder of the world outside of the United States and Canada.

AVRO and WACO—Main Aeronautics Company, Pittsburgh, Pa., for western Pennsylvania.

RYAN—Pickwick Airways, Inc., for Mexico.

BELLANCA—Bellanca Aircraft of Canada, Reg., Montreal, for Canada.

BACH—Schlee-Brock Aircraft Corporation, Detroit, Mich.

FIRESTONE—Universal Aviation Corporation.

PERSONNEL

MALCOLM R. WHITE, has been elected president of the American Airports Corporation. He is also president of the Indian Head Corporation and director of Colonial Airways Corporation, Motorless Aviation Corporation, and Liberty Electric Corporation.

BURT ISON has resigned from Universal Aviation Corporation to become manager of the Aviation Department of the Cook Paint & Varnish Company, St. Louis.

HOWARD FOWLER has been named operations officer for the Port of Portland Airport. He will have control of all air traffic on the field and the enforcement of field regulations.

ALLISON N. MILLER has been named president of the Congressional Airport, Washington, D. C. He succeeds Maj. Harry M. Horton, resigned.

EDWARD J. QUIGLEY has been appointed assistant pilot for the Firestone Tire & Rubber Company.

PROF. J. H. PARKIN, formerly associate professor of Mechanical Engineering at the Toronto University, has accepted a position with the National Research Council as assistant director in the Department of Engineering Physics in charge of aeronautical research.

C. M. KEYS is president of Pitcairn Aviation, Inc., following the recent change in ownership. CAPT. THOMAS B. DOE is vice-president and general manager, LIEUT. H. A. ELLIOTT, vice-president and operations manager, J. A. B. SMITH, secretary and treasurer, JOHN SANDERSON, assistant secretary and treasurer, and RALPH S. WESTING, business manager.

LIEUT. RICHARD ALDWORTH, who has been manager of the Newark (N. J.) Airport, has returned to Langley Field, Va., for duty with the Air Corps at the expiration of his leave of absence. GEORGE W. BRANSOM, operations manager and chief pilot of the Washington-New York Air Line, has been appointed manager.

WALTER DEISCHER, president of the Ottawa Flying Club, has been elected president of Canadian Flying Clubs of Eastern Canada, Inc.

MAC SHORT, vice-president of the Stearman Aircraft Company, has been appointed second in charge of the technical staff of United Aircraft & Transport Corporation, and remains as vice-president of the Stearman Company, whose officers have not changed following the recent merger.

CHARLES HAINES HOPKINS, of the Oklahoma State Chamber of Commerce, has been appointed personal representative of Maj. W. B. Robertson, president of the Curtis-Robinson Airplane Manufacturing Company of St. Louis.

FLYING OFFICER G. T. STEEVES, R.C.A.F., formerly of the instruction staff at Camp Borden, has accepted the position of chief test pilot and salesman

(Concluded on page 350)

TRADE TIPS
It has been reported that

An opportunity for an airport developing company to establish an airport at Grand Haven, Mich, has been reported through the Eagle-Ottawa Leather Company of that city.

The P-W Electric Company of Hattiesburg, Miss, is anxious to receive information relative to the equipment of an airport, with particular reference to the electrical installations.

Ocala, Fla, is planning to build a municipal airport on a 180-acre tract.

E S Slusher, vice-president of the Northern Illinois Telephone Company, of Kewanee, Ill, is reported to be negotiating for the purchase of a large cabin monoplane. Other Kewanee business men are reported to be contemplating the purchase of a plane upon completion of the Kewanee Airport.

Improvements totalling about $10,000 will be made at the Great Falls (Mont) Municipal Airport, soon.

Bids are to be called for soon for two large hangars and adjoining administration buildings at the Swan Island Airport, Portland, Ore, the outlay to be about $75,000.

M Poulson, city recorder of Salem Ore, is considering bids for construction of a hangar at the Salem Municipal Airport.

Judge H F McElroy, city manager, Kansas City, Mo., is having plans prepared for an airport terminal at the Municipal Airport.

DuPont Airport, Denver, Colo, owned and operated by Floyd Clymer, Inc, 749 Broadway, Denver, is reported to be for sale.

Curtiss Flying Service will build hangars and headquarters buildings, costing about $50,000, at the Miami (Fla.) Municipal Airport, according to A H Heermance Municipal Director of Aviation.

I A Yarnell of Lake Wales, Fla., graduate of the McMullen Flying School, of Tampa, is planning to buy a plane.

William F Barry, St. Louis brick contractor, now taking a Limited Commercial pilot's course at St Louis Universal Flying School, plans to purchase a plane after completing his training.

Bids will be received by the city of Davenport, Ia, for the new 100x110 ft. hangar which will be erected on Cram Field for the Illinois Iowa Airways Company, Inc.

The City of Sacramento Calif, is having plans prepared for construction of a group of airport buildings on its 236-acre airport, to include hangars, pumping station hotel etc to cost about $900 000.

An airport is soon to be established at Nampa Ida, by means of bonds recently voted for that purpose.

The City Council of Brady Tex, has leased a 157-acre tract and will immediately begin clearing it up for an airport.

Muskogee, Okla, is about to take bids for construction of a hangar at the municipal airport, and also for grading and draining of the runways.

The Alamo Airplane Company, Milam Building, San Antonio, proposes erection of airplane factory, hangars, etc, to cost about $150 000.

Harry Stackhouse is chairman of the Aviation Committee of Lawton, Okla, which is taking bids for construction of 80x125 ft. hangar at the municipal airport.

The City of St Paul, Minn, will take bids late this summer on construction of hangar to cost about $75,000 at the municipal airport.

The Mankato Chamber of Commerce, Mankato, Minn., is planning erection of a 60x60 ft hangar at the municipal airport.

Western Air Express, of Los Angeles, Calif., has authorized plans to be drawn for hangars to be erected at Millers, Calif, Hesperia, Calif, Seligman, Ariz, Albuquerque N M, Alva Okla, Kansas City Mo and Lyndt Utah.

The Commissioner of the Department of Public Utilities Chattanooga, Tenn, is about to let the contract for construction of a building at Lovell Field, to house hangar, boiler room terminal building and pump house.

AERONAUTICAL CALENDAR

Aug 16-25	Ohio Goodwill Air Tour, starting from Port Columbus and ending at Cleveland during the National Air Races
Aug 23-Sept 9	Second National Aircraft Show Toronto, Canada
Aug 24-Sept 2	National Air Races and Aeronautical Show, Cleveland Ohio
Aug 26-29	Joint Aeronautic Meeting of the Society of Automotive Engineers and the Aeronautical Chamber of Commerce, Cleveland Hotel, Cleveland
Aug 27-29	Second meeting Western States Aeronautic Association, Salt Lake City
Sept 2-7	Class C Aviation Exhibit Rochester Exposition at Rochester N Y
Sept 6-7	Schneider Cup Race over the Solent, Cowes England
Sept 9-14	Nebraska Air Tour Auspices Omaha Chamber of Commerce
Sept 23-28	Fourth Annual New England Aviation Exposition, Boston Garden, Boston Mass
Sept 29	Gordon Bennett Balloon Trophy Race, St Louis Mo
Oct 5-21	National Air Tour, Starting from Ford Airport Dearborn Mich
Oct 12-27	Southwestern Aircraft Exposition State Fair Grounds, Dallas, Tex.
Oct 24-25	Conference on Municipal Airports at Washington D C, under auspices of the American Road Builders Association
Nov 10	Lehigh Airport Design Competition Closes, Lehigh Portland Cement Company
1930 February	National Air Show auspices Aeronautical Chamber of Commerce, St Louis
Feb 5-12	New York Aviation Show auspices Aviators Post American Legion
April 5-13	All-American Aircraft Show, Detroit
May 3-10	New York Aircraft Salon, auspices Metropolitan New York Division, Distributor-Dealer Section, Aeronautical Chamber of Commerce, at Madison Square Garden, New York City
Aug 16-25	Ohio Goodwill Air Tour, starting from Port Columbus and ending at Cleveland

Personnel
(Continued from preceding page)

for the Ottawa Car Manufacturing Company, manufacturer of Avro Avians in Canada.

A H Wilson of Victoria, B C, has been appointed instructor of the Aero Club of British Columbia, Vancouver, B C.

Paul R Riley has been elected director of sales and organization for the Yellow Air Cab Company, Wichita, Kan.

L W Ashton, formerly of the Baldwin Locomotive Works, has been appointed sales office manager, of Bellanca Aircraft Corporation, New Castle, Del. Howard P Young has been made sales engineer and pilot.

W H Phelan is the new sales manager for Main Aeronautics Company, of Pittsburgh.

Cloyd Clevenger, formerly with Garland-Clevenger School at Tulsa is to head the Curtiss Flying Service branch in that city. J H De Celles and Don Diegel will be his assistants.

Robert Powell has been appointed by the Nebraska State Railway Commission to take charge of a new department, having supervision of airplanes, buses taxicabs and public cars.

M M Canfield, T.A.T, courier on the eastern division, has been transferred to the western division. Ben H Dally, of St. Louis, will replace him in the eastern division.

Capt. Bogart Rogers has been appointed general field manager at the Grand Central Air Terminal Glendale Calif.

Jack Morgan will supervise the Dallas factory branch of American Eagle Aircraft Corporation Bert Purnell will be pilot-demonstrator.

Staff Sergt. Ralph T. Hamilton, of the 118th Observation Squadron, Connecticut National Guard, has been appointed inspector with the Connecticut department of aeronautics.

George P Kane, formerly connected with the Connecticut state department of motor vehicles, is now chief clerk of the state department of aeronautics.

F G Jeynes recently with the Aeronautics Branch in Washington, has been appointed inspector in the southeastern section with headquarters in Atlanta. He will work with Supervising Inspector Leo C Wilson and Inspector Murray Hall.

Lieut E E Crumpler, formerly with the Canadian air force has been placed in charge of the Braley School of Flying at Alva, Okla.

W G Herron has been elected vice-president of Air Investors, Inc, he was formerly vice-president of Boeing Air Transport, Inc.

Joseph F Martin, operations manager of the Clifford Ball, Inc, lines, has been appointed operations chief at the Cleveland Airport during the National Air Races.

AIRPORTS AND AIRLINES

French Line Resumes Ship-Shore Service

NEW YORK (N. Y.)—Ship to shore air mail service will be resumed from the French Line steamship "Ile de France" on her current sailing to this port. Three successful transfers of mail from the ship were made by air last summer, but the service was abandoned when the plane used developed engine trouble and was forced down on the fourth trip. A new machine, specially constructed to withstand the strain put upon it by the catapult, will be used beginning immediately. [The catapult installation on the "Ile de France" was described on p. 336, of Aviation July 28, 1928]

Similar to the air service from the S S "Bremen" [described in Aviation, Aug. 3, 1929, p. 263], the "Ile de France" will launch the mail plane at a distance of about 500 mi. from shore depending upon weather conditions and time of day. The air mail fee for this service in addition to regular postage, is $.60 for each half ounce or fraction in the case of letters or postcards, and $.25 for each two ounces or fraction of printed matter or merchandise.

Mail transit time between Germany and the United States will be reduced 17 hr by a special arrangement between the Luft Hansa and the French Government. Mail planes leaving Cologne at 10 a.m. will be permitted to fly over the fortress at Cherbourg to deliver mail to the liner "Bremen" which will then be 17 hr out of Bremerhaven.

Southern Connects With Mexico Line

FORT WORTH (TEXAS)—A 12-hour connection between Mexico City and Fort Worth and Dallas is afforded by a rearrangement of schedules which became effective August 1 on the passenger line to Brownsville operated by the Texas Air Transport Flying Service, Inc., a subsidiary of Southern Air Transport.

The passenger service follows the south Texas air mail route, which is being lighted by the Aeronautics Branch. A passenger leaving Mexico City at 7:45 a.m. on the Mexican Aviation Company's line to Brownsville arrives in Fort Worth at 7 p.m. having transferred at the border to the Flying Service plane.

A reduction in air fares from 12 cents to 10 cents per mile was announced by Robert J Smith, traffic manager for S.A.T, which went into effect simultaneously with the rearranged schedule.

Mamer Improves Service

PORTLAND (ORE.)—Mamer Air Transport planes, flying between Spokane and Portland, have been placed on an hour earlier schedule in order to make direct connection at the Port of Portland airport with north and south bound West Coast Air Transport planes. Under the new schedule the regular morning departure from Spokane is 6 a. m., bringing the plane to Portland at 9:f5 a. m. Departure from Portland on the return trip is 4 p. m. with arrival at Spokane at 7 30 p. m. The line was to be extended to Seattle August 10.

Air Mail Again Shows Gain in Monthly Traffic

WASHINGTON (D. C.)—Once more a new monthly air mail record has been made according to figures for July recently announced here. The total for July was 638,810 lb., an increase of 45,556 lb over June. The total for June was 593,254, for May 587,471 lb, for April 508,672 lb. for March 523,4f4 lb. for February 435,581 lb., for January 475,93f lb.

The daily average increased 821 lb., that is from 19,775 lb in June to 20,606 in July. The poundage shown by routes is as follows:

Routes	Miles	May	June	July
Boston-N Y	192	10,894	11,249	11,954
Chicago-St. L	219	6,874	7,403	7,811
Chicago-Dallas	1,059	36,724	31,521	36,442
Salt L Los Ang	660	61,558	60,720	65,669
Salt Lake-Pasco	530	12,891	17,751	18,146
Seattle-Los Ang	1,141	21,252	22,179	23,878
Chicago-Minne	503	11,665	11,977	20,134
Clevelnd-Pitts	123	6,349	5,891	5,687
Chey Pueblo	199	8,539	8,152	9,475
Cleve L'ville	345	9,515	10,581	10,622
N Y-Chicago	718	133,830	146,104	154,178
Chicago-San F	1,932	150,947	148,487	157,502
N Y-Atlanta	763	30,069	30,840	32,017
Albany-Cleve	446	9,058	8,170	8,641
Dallas-Galv	320	4,785	4,891	3,541
Dallas-Browns	529	7,716	6,703	6,323
Atlanta New O	483	8,852	9,798	7,750
Chicago-Cin	270	8,981	4,542	6,920
Atlanta-Miami	736	8,907	8,171	8,674
Gr Falls-Salt L	489	6,799	7,380	7,797
Chi Bay City	712	15,565	17,342	18,866
St L-Omaha	403	4,228	4,198	5,719
New O-Houston	319	4,855	5,304	3,748
Chi Atlanta	768	6,948	8,254	8,776
Total	13,858	587,471	593,254	638,810

The Post Office Department has reported that as of August 1 there are 22,552 mi. of air mail routes in the Western Hemisphere under contract with the United States Government. Of this total, approximately 8,747 mi. are outside the continental United States. The longest route under a single contract is that of 3,071 mi between Cristobal, C.Z. and Santiago, Chile, operated by Pan American Airways and affiliated companies. Pan American also operates the route from Miami to Curacao, Dutch West Indies, by way of Cristobal. This is 2,964 mi. long. (See report on amounts paid contractors for mileages of domestic routes.)

Radio Experts Announce Plan
Operating Agreement Reached Among Concerns

WASHINGTON (D. C.)—An operating agreement providing for the allocation of radio channels reserved to commercial aviation was tentatively adopted at a conference of representatives of the air transport companies and officials of the Federal Radio Commission and Commerce, War and Navy Departments on August 7. The plan conforms to the proposals made by the engineers of the Radio Commission and will be submitted to the Commission for approval when it convenes in September after it has received the final acceptance of the air transport operators.

As outlined at the conference, the operating plan is designed to make practical and efficient use in plane-to-ground and ground-to-plane communication of the available frequencies. Channels will be assigned to the air transport companies individually for use over their routes, such assignments to be made by the Radio Commission upon the recommendation of the Airways Division of the Aeronautics Branch with the understanding that any air transport line may use the facilities of any other company when flying over its territory. This is designed to avoid duplication of allocations. The expense of maintaining the ground stations will be prorated among the air transport lines according to the extent to which the service is used.

Plan For Itinerant Planes

Provision is made in the operating agreement for itinerent planes. Channels will be assigned for calling such planes and for transmitting messages from plane to ground. If itinerant planes are operated along the regular airways at frequent intervals or on regular schedules consideration will be given, upon application, to granting such planes the frequencies assigned to the route over which the plane operates.

The calling frequencies to be used in the low intermediate and high frequency bands are specified in the plan, although the designation of the high frequencies as calling frequencies is tentative. The conference went on record to the effect that station-to-station communication should not be permitted except where the land-lines cannot be utilized satisfactorily. There is no objection to point-to-point service, however, in handling emergency mes-

(Concluded on Page 353)

AIRPORT CONSTRUCTION PROJECTS

Two hundred thousand dollars will be spent on a new airport at Brunswick, Ga., between the city and St Simon's Island. The airport will be a mile square, involving considerable filling. The project is being backed by Howard E. Coffin, it is reported. Work on the new runways at Candler field, Atlanta, Ga., is progressing rapidly. The first of the new runway is 35 per cent completed. Five others are on the expansion program. A concrete apron will be laid in front of the hangar line. Altogether the work will take about ten months.

Expenditure of $53 000 has been appropriated by the Westchester County Board of Supervisors in New York State for the acquisition of a county airport site at Croton Point Park. The 300 acres acquired some time ago by Robert C. Hayes, of Hayes Aviation, Inc., at Cicero, N. Y., are being rapidly developed into a modern airport. The field has a frontage of 4,400 ft., on the main highway between Watertown and Syracuse.

To Build Cafe at Glendale

Ivar Ringdahl of Rome, N. Y., has bought a tract of 40 acres for the development of a privately owned and operated airport. A hangar is to be installed at once. A permit has been secured for the building of a cafe and coffee shop costing together $30 000 by the Grand Central Air Terminal, Glendale, Calif.

Atlantic Coast Airways Corporation, has completed its work of converting the old Atlantic City (N. J.), Yacht Club property into a terminal and waiting room costing more than $17 000. The renovated building has facilities on the first floor for ticket office, baggage room, mechanics' quarters and manager's office. On the second floor is a passenger waiting room, kitchen, pantry and porch. On the top floor are pilots' quarters and showers.

Complete Grosse Ile Hangar

The new 25-plane 125x100 ft. hangar of brick and steel at Grosse Ile (Detroit) Airport has been completed for the Curtiss Flying Service of Michigan. Universal Aviation Corporation has secured options on 610 acres at an average cost of $330 an acre on Horseshoe Lake near Granite City, Ill. This will bring the air-mail terminal within 20 min of downtown section of St. Louis as compared with the 40-min trip by automobile now required between Lambert-St. Louis Field and the downtown section.

Kewanee Airports Company, Kewanee, Ill., will start work this fall on a 320-acre site for which $41 600 has been subscribed. The improvements at Mills Field, San Francisco, costing $60,000 will be started very soon. The work includes the surfacing of the hangars, additional drainage, relocation of floodlights, additional office and shop space.

Construction work has started on the first permanent heavier-than-air craft hangar at the Akron, Ohio, Municipal Airport. The building being erected for Air Services, Inc., embodies a number of features new in hangar design, and it will serve as a standard for additional hangars to be built on the port. The Air Service hangar, to be completed late in September, will be of brick and steel construction, has a span of 100 ft. and is 80 ft. long.

Improve St. Hubert

Grading and laying of lengthy runways and other improvements at a cost of approximately $200 000 are being carried out at the St. Hubert Airport (Montreal). Arrangements for the erection of the Montreal Light Airplane Club house and hangar are practically completed and it is expected that the club will be able to occupy their new quarters in September.

Oiling of a 250-ft. taxi strip between Byrd and Lindbergh Avenues on the Los Angeles Metropolitan Airport, to provide a dust proof taxi way from the main field runway to the hangars of the Angelus Aero Corporation, Caddo Film Productions, Ruckstell, Inc., and the Apache Engine Company has been completed according to Waldo Waterman, field manager. Expansion of field activities has been so rapid that a complete new portion of the field will be opened to hangar development in September, it is said.

W.A.E. Inaugurates Air Express Service

LOS ANGELES (CALIF.)—Shipment of express packages over Western Air Express planes operating between Los Angeles and Kansas City, was inaugurated August 6, under an agreement reached between the Western Air Express and Railway Express Agencies, successors to the American Railway Express.

Officials have announced that express shipments must be limited to 200 lb. in weight and that they cannot exceed 60x19x40 in. in dimension. The through trip from Los Angeles to Kansas City is made in about 12 hr. by Western Air Express planes touching Kingman, Ariz.; Holbrook and Albuquerque, N. M.; Amarillo, Tex.; Wichita, Kan.; and Kansas City, Mo.

Utica Port Earns $1,813.50

UTICA (N.Y.)—Official records of the Department of Public Works show receipts from the operation of the Utica Municipal Airport to August 1 of $1,813.50. This amount has been received by the city in payment for rental of hangar space and for use of the field. Up to August 1 there had been expended on the airport here $172,823.63 of the bond issue of $250,000 provided for its establishment.

Use Cleveland Air Terminal

CLEVELAND (OHIO)—Maj. John Berry, superintendent of the Cleveland Airport, has moved into the new $85 000 airport terminal building. The building is to be officially opened Aug. 16.

Post Office Reports June Air Mail Record

WASHINGTON (D. C.)—The statistical report covering operations of the air mail service on the 31 domestic routes for the month of June was issued recently by the Post Office Department. It shows that the Government paid a total of $1,161,461 to the contractors for the transportation of 598 494 lb. of mail. The planes were flown over 1,156,121 mi. of the total of 1 178 270 which were scheduled over airways having a total mileage of 14,345. The figures are as follows:

Route Number and Termini	Length of Route (Mi.)	Frequency per Month (Rd. Trips Scheduled)	Miles of Service Scheduled	Miles of Service Actually Flown	Total Weight of Mails (Lb.)	Amount Paid to Contractor
1 Boston-New York	192	25	11 752	11 246	13 249	$33,746 81
2 Chicago-St. Louis	278	60	33 360	[illegible]	[illegible]	17,934 07
3 Chicago-Dallas	1 059	30	63 540	61 307	31 599	94,766 54
4 Salt Lake City-Los Angeles	461	60	27 660	27 174	[illegible]	[illegible]
5 Salt Lake City-Pasco	600	56	66 000	66 600	60 758	183,155 12
8 Seattle-Los Angeles (a)	530	30	31 800	30 772	[illegible]	33,254 12
9 Chicago-Minneapolis	1 141	[illegible]	68 460	[illegible]	[illegible]	63,882 45
11 Cleveland-Pittsburgh	385	[illegible]	[illegible]	[illegible]	11 093	32,982 04
12 Cheyenne-Pueblo	125	60	15 000	14 745	3 991	17,674 31
16 Cleveland-Louisville	199	30	11 940	11 206	5 894	7,267 46
17 New York-Chicago	345	60	41 551	42 961	10 571	17,890 70
18 Chicago-San Francisco	710	60	117 078	115 828	141 821	115,989 93
19 New York-Atlanta	1,932	56	224 472	218 985	149 229	307,516 52
20 Albany-Cleveland	763	30	55 260	53 596	36 730	95 198 30
21 Dallas-Galveston	445	25	31 150	30 919	6 170	16,934 07
22 Dallas-Brownsville	320	30	20 510	20 532	4 092	14,122 53
23 Atlanta-New Orleans	525	30	31 240	31 244	6 705	19,371 07
24 Chicago-Cincinnati	483	30	30 912	30 912	9 668	16,934 29
25 Atlanta-Miami	270	30	16 200	15 199	4 102	6,123 43
26 Great Falls-Salt Lake City	736	25½	37 768	37 779	3 272	7,877 73
27 Bay City-Chicago	489	30	38 160	38 160	2 300	18,867 35
28 St. Louis-Omaha	712	30	31 470	49 905	12 839	15,421 80
29 New Orleans-Houston	405	30	24 300	22 514	4 163	5,251 85
30 Chicago-Atlanta	319	30	19 140	17 164	6 234	3 256 25
31 Chicago-Muskegon Airport-Grand Rapids Ramp Chicago (b)	769	30	46 140	46 000	8 235	6 437 38
	9	15	135	135	3 349	210 00
Totals	14 345	9325	1 178 270	1 156 121	598 494	$1,161 461 08

(a) Southbound trip not operated between Seattle and Portland.
(b) Service effective June 15, 1929.
Supplemental payments Route 19, 651 lb., 12 oz., $197 25—May.

Radio Experts Announce Plan

(Continued from Page 351)

sages conducive to the safety of life and property.

The belief was expressed by Commissioner Starbuck, who presided at the conference, that the agreement reached will permit maximum utility of a minimum number of frequencies for the service of air transportation. Subsequent conferences will be held to consider further those features of the plan which are still in tentative form in order to bring them into conformity with the provisions made for aviation in the international radio telegraph convention of 1927. The draft of the operating plan follows:

The tentative radio frequency operating plan for aviation stations is as follows:

1. Calling frequencies. Low frequencies—278 kc., calling and working frequency from ground station to privately owned and operated planes, ten watts at airports; 333 kc., international air calling frequency; 375 kc. Radio Compass; 500 kc. international calling and distress frequency for ships and aircraft over the seas.

High frequencies—2506 kc., calling and working frequency from privately owned planes to ground stations (Ground stations will not transmit on this frequency. It will be used only for receiving from planes); 4026 kc., national high frequency calling frequency for use by commercial and government stations and planes; 5,520 kc., 11,050 kc., 16 580 kc. primarily for coastal stations and ships, may also be assigned to aircraft only for purpose of calling a U. S. coastal station when aircraft is in flight over the sea.

Set up for experimental investigation

2. Chains, stations and planes. Intermediate frequencies—(a) Assign 278 kc. to all airport stations owned or operated for the purpose of calling and transmitting to privately owned and operated planes. This channel will also be assigned to all other aeronautical ground stations for the same purpose. (b) Approval of medium frequency assignments to chains only when the routes to be licensed are sufficiently remote from the coast to insure that no interference will result with coastal and ship communication. The only medium frequencies available for assignment are 382, 400, 414, 420 and 457 kc.

High frequencies—(a) Assign to each recognized chain at least one channel above 2,500 kc., and at least one channel below 2,500 kc. Allow chain planes and ground stations to call and work on the chain frequency.

3. Ground stations and planes not operating along main air chains. (a) License itinerant (taxi) planes to use 4,026 2,500 kc. hereinafter assigned also for privately owned and operated planes, for the double purpose of calling and transmitting messages from plane to ground. If itinerant planes are operated along regular air chains at frequent intervals or on regular schedules, consideration will be given upon application in granting such planes the chain frequencies assigned to the chain over which the planes operate.

(b) Assign maritime ship calling and working high frequencies to any aircraft desiring the same for long distance flight over the sea.

(c) Planes desiring intermediate frequencies for sea flights should use frequencies as follows: Calling, 333, 500 kc. Radio Compass 375 kc. Working 414 and 457 kc.

4. Power—Power should be limited as follows: Ground stations 1 000 watts.

5. Discussion — (a) Point to point aeronautical service should not be permitted except where a system cannot utilize the landlines satisfactorily. It is understood the arrangements are now under way to provide a 10 min. service by landline between certain airports. There should be no objection however to ground stations working on a point to point basis for the sole purpose of handling emergency messages concerning the safety of life or property.

Among those attending the conference, in addition to Commissioner Starbuck, were Federal Radio Commissioners E. C. Sykes and H. A. Lafount, Capt. Guy Hill, Chief Engineer, Radio Commission; Lieut. E. K. Jett, and G. C. Gross, engineers of the Commission; Dr. J. H. Dellinger, Chief of the Radio Division of the Bureau of Standards; Herbert Hoover, Jr., technical adviser, of Western Air Express; Capt. S. C. Hooper, Chief of Naval Communications; Lieut. Comdr. T. A. M. Craven, radio expert of the Navy; Lieut. Comdr. H. E. Fisher, Navy; Paul H. Brattain, Aeronautical Chamber of Commerce; Capt. F. C. Hingsburg, Chief of the Airways Division, Aeronautics Branch; W. D. Terrell, Chief, Radio Division, Department of Commerce; Capt. E. R. Petzing, Signal Corps, Army; Lieut. Comdr. D. B. Duncan, radio expert, Bureau of Aeronautics; Lieut. L. M. Wolfe, Army Air Corps; F. D. Webster, Colonial Airways; M. W. Swanson, Universal Aviation Corporation; G. Kurbaum, Colonial Airways; E. W. Proctor, Transcontinental Air Transport; M. M. Eells, National Air Transport; Thorpe Hiscock, Boeing Air Transport, and representatives of the Pan American Airways and Curtis interests.

Continental Announces Plans

CHICAGO (ILL.)—The proposed direct air route between this city and New Orleans will start sometime in September, according to an announcement of the incorporation under the laws of Delaware of the Continental Air Services to take over the business and assets of the Continental Air Services of Illinois. The new corporation will operate a passenger and express business between Chicago and New Orleans, Chicago and Washington by way of Pittsburgh.

Canadian Firm Opens Air Express Service

TORONTO (ONT.)—The first daily air express operating in Canada was inaugurated between Toronto, Hamilton, London and Windsor on August 8 when a Fairchild cabin monoplane piloted by Captain R. H. Bibby took off from the Canadian Airways field at Weston. This service was inaugurated by the Canadian Pacific Express Company, pioneers in air express since the Government first started the air mail service and will be continued winter and summer, weather conditions permitting.

The schedule will be as follows: Leave Toronto 1 45 p.m., arrive Hamilton 2 15 and leave 2.30 p.m., arrive London 3 15 and leave 3 30 and arrive at Windsor 4 30 p.m. The return will be on the following morning, leaving Windsor at 7 40 a.m. and arriving at Toronto at 9 a.m. The express rate is $.10 per ounce, minimum weight 4 oz., and the same rate to all four places, according to the announcement.

Cleveland-D. C. Line Opened by Clifford Ball

CLEVELAND (OHIO) — Passenger service between Cleveland, Pittsburgh and Washington was inaugurated August 14 by the Clifford Ball, Inc. One trip is made each way daily with the exception of Sunday.

The trip between Cleveland and Washington is scheduled for 3 hr. Planes leave here at 12 30 p.m., arrive at Pittsburgh at 1 45 p.m., and at Washington at 3 30 p.m. The plane from Washington to Cleveland departs at 12 30 p.m., arrives at Pittsburgh at 2 30 p.m., and Cleveland 4 p.m.

Fare from Cleveland to Washington is $45 and to Pittsburgh $18. Fare from Pittsburgh to Washington is $27.

Bettis Field is used as the Pittsburgh terminus and Hoover Field at Washington. For the present the Ball line is operating out of the United States Air Line hangar at Cleveland. Plans for a new Ball hangar at the airport are being developed and work will start this summer, according to J. F. Martin, operations manager.

Using Fairchilds

The new passenger service is maintained with a fleet of Fairchild 71 six-passenger cabin planes. They are powered with Pratt & Whitney Wasp engines of 425 hp.

R. L. Baker, veteran Ball air mail pilot, and Earle Smith, formerly on the Cleveland-Chicago passenger run of the Universal Aviation Corporation line, are pilots on the line.

Washington planes will make connections here with passenger planes to and from Detroit on the Stout Air Service, Inc., and Thompson Aeronautical Corporation lines. Transportation to and from the airport is to be maintained by bus service from the Consolidated Air Travel ticket office.

Mid-Continent Starts Lines About Agust 20

OKLAHOMA CITY (OKLA.)—Mid-Continent Air Express, which is affiliated with Western Air Express, is to begin connections about August 20. The company's planes will fly between Denver and El Paso and between Denver and Kansas City. The first line will run from Denver, through Colorado Springs, Pueblo (possibly Santa Fe), Albuquerque, and thence to El Paso. The second line will branch off at Pueblo and go through Dodge City, Wichita, Topeka and terminate at Kansas City.

Albuquerque and Dodge City will be division points. The former already is a division point for the Los Angeles-Kansas City dawn-to-dusk line of the Western Air Express. A tentative schedule calls for 5½ hr. flying time between Denver and El Paso and the same from Denver to Kansas City. Albuquerque and Denver will be 3 hr. apart.

FOREIGN ACTIVITIES

International Light Plane Tour Launched

PARIS (FRANCE)—There is being held now one of the most unique sport flying events in the world. This is the annual International Light Plane Tour of Europe organized by the Aero Club of France. The tour started August 3 from the Orly Airdrome, south of this city, and will finish there August 20. Forty-six planes started in the event.

The course is 3,776 mi. long and includes stops at 23 cities in addition to Orly. They are Basle, Geneva, Lyons, Marseilles, St. Raphael (in the south of France), Turin, Milan, Venice, Zagreb, Belgrade, Turnu Severin, Bucharest, Budapest, Bruno, Prague, Breslau, Warsaw, Posen, Berlin, Hamburg, Amsterdam and Brussels.

As is evident the tour covers most of the countries of Europe. Most of these countries, too, are represented by one or more planes in the tour. The entry list read as follows: Germany 34 machines, Italy 14, France 28, England 4, Czechoslovakia 4, Belgium 2, Switzerland 2, Jugoslavia 2, and Brazil, United States, Austria and Canada, one each.

Germany was represented by Klemm and BFW-M23, both low wing monoplanes. Italy by Breda, Fiat and Caproni types. France by Caudron, Petez and Albert planes, England by a Spartan and Moths. Czechoslovakia by Avia B. H. 11 Antelopes, low wing monoplane, etc. Two Cierva autogiros were among the entries.

The grand prize for the competition is the Challenge Cup offered by the Aero Club of France. Many other prizes are being offered for a wide variety of competitions held in conjunction with the main event. All-round performance is to be preferred in the judging to the mere qualification of speed.

One of the minor contests will be a test of fuel consumption, which was to be carried out some time between August 4 and 9 at some point along the course. The results of this have not been announced yet. It was to be over a closed course of 31 mi. covering a total distance of 186 mi. Points were to be won also for such items as parachute equipment, instrument installations, comfort of crew, protection against fire, undercarriage strength, etc.

[Further details of this event will be included in a later issue of AVIATION.—ED.]

Agree to Keep Women's Records

COPENHAGEN (DENMARK)—A separate category for records established by women has been agreed upon by the delegates at the recent Federation Aeronautique Internationale here.

Russian Plane on Way to U. S.

NOVOSIBIRSK (SIBERIA)—En route from Omsk to Krasnoyarsk, the soviet airplane "Land of the Soviets" made an unexpected landing here. It is expected that the flight from Moscow to New York will be resumed immediately. It left Moscow at 3.05 a. m. August 8.

Air Mail Influences Foreign Exchange Rates

SANTIAGO (CHILE)—Modification of rates of exchange for sight and 90-day sight drafts, on account of the savings in interest charges has resulted from the regularity and speed of air mail service, according to an announcement by the Central Bank of Chile. The service of the Compagnie Generale Aeropostale (Latecoere Air Lines) between Chile, Argentine, Uruguay, Brazil and Europe is responsible for this change.

The length of time required for mail from Chile to reach Europe has been reduced from three weeks or a month to approximately ten days, and corresponding reductions have been made in the mail time to Buenos Aires and Rio de Janeiro. Of course this also affects the time required for mail to reach New York, and the price of drafts on New York has also been changed.

Duchess Flies to India and Back

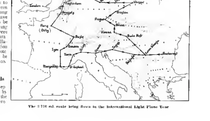
LONDON (ENGLAND)—The Duchess of Bedford, accompanied by Capt. C. D. Barnard, pilot and Robert F. Little mechanic, landed at Croydon at 7 p.m., August 9 at the conclusion of a 7½ day round trip flight to India. This is the fastest round trip between England and India on record.

Aviation in Mexico Gains in Popularity

MEXICO CITY (MEXICO)—Air-mindedness has gripped the Mexican public both native and foreign. More and more people in this Republic are traveling by airplane and business men in Mexico have come to realize that air trips save both money and time. The popularity of this mode of transport is decidedly on the increase. A short time ago the Mexican public traveled in planes by the half dozens, now they do so by the hundreds.

Figures concerning passenger traffic covering the first half of the present year, issued by the Mexican Aviation Company which operates the principal air lines in Mexico, show that 3,058 persons traveled as paid passengers on all its routes—the Mexico City-Tampico-Brownsville, Tex., the Tampico-Tuxpam and the Vera Cruz-Merida lines. The number of passengers carried by months was: January 296, February 272, March 711, April, 485, May 566 and June 628. The heavy travel during March is explained by the fact that the military revolt then in progress seriously disrupted rail communications and great numbers of people used planes to get in and out of the country.

Airways in active service in Mexico total 4,399 km. (2,749⅜ mi.) according to the Post Office Department but when concessions for new lines that will extend from the American to the Guatemalan borders and across the country in various directions have been realized, Mexico's aerial network will comprise upward of 19,000 km. (11,875 mi.). Most of these routes will be inaugurated by the fall, it is announced.



The 3,776 mi. route being flown in the International Light Plane Tour

Foreign News Briefs

At the recent British International Aero Show the Blackburn Aeroplane and Motor Company displayed a model of a flying boat powered with six Rolls Royce H engines, which it proposes to build within a couple of years.

A Westland Widgeon, English light monoplane, has been tested successfully with float attachments.

According to the latest reports, the air trials of the new British airship R 100 will take place the latter part of September. It is understood that inflation of the R.100 has been under way since July 29 and that various tests within the hangar are being made preliminary to the flight tests.

One of the outstanding items in the several celebrations recently which marked the twentieth anniversary of the flight of Louis Bleriot across the English Channel was the display of a motion picture film he had accumulated through the years showing the development of all the Bleriot planes from the earliest days. The film is understood now to be in a French museum for safe-keeping.

The Dornier Do X, world's largest flying boat, is scheduled to make a two-hour flight to Geneva September 7 at the time of the laying of the cornerstone of the League of Nations building.

Sir Philip Sassoon, Under Secretary of State for Air in the Baldwin Government, has been elected chairman of the Royal Aero Club, replacing Lord Thompson, now Secretary of State for Air.

At Stuttgart, Germany, an aeronautical museum will be erected to which the whole inventory of the Zeppelin museum at Friedrichshafen is to be removed.

A Russian all-metal biplane (Soviet Wing) powered with three air-cooled 230 hp. Titan engines, is making a cruise over Europe and visiting such centers as Rome, Vienna, Berlin, Paris and London.

It has been reported that 340 officers and 1,639 airmen participated in the recent R.A.F. Display at Hendon, England, about 9,800 gal. of fuel and 653 gal. of oil were consumed in the maneuvers, including the flying to and from Hendon.

The air speed indicators for the English Schneider Trophy Contest planes read up to 400 m.p.h. and the tachometers read up to 4,400 r.p.m.

"Wing walking" on English light planes, such as the Moth, Avian, etc., has been prohibited by an Air Ministry order on account of the danger of structural damage to the aircraft during such exhibitions.

Vicomte and Vicomtesse de Sibour completed their 30,000 mi. world tour by Moth and steamship when they landed at Stag Lane Airdrome July 19. They landed from the steamer in France and visited Paris before flying home.

At the recent convention of Balkan States it has been stated that Soviet Russia at present possesses a fleet of no less than 4,300 planes, a good many of which may be used as amphibians. The total includes about 1,000 reconnoitering and bombarding planes which can attain a speed of 170 m.p.h.

William P. MacCracken, Jr., delivered the Wilbur Wright Memorial Lecture at the Conversazione given by the Royal Aeronautical Society in London July 25. The lecture was a review of the work of the various divisions of the Aeronautics Branch in the development and supervision of American aircraft industry.

K. L. M. (Royal Dutch Air Lines), which put special freight planes on its various regular services, last month carried in them a lot of boa-constrictors for a circus at Brussels as well as tigers and chimpanzees. Other contracts include regular conveyance of British built motor-cars to Holland. Last year's transports included 678,000 lb. of horticultural produce, according to recent reports.

For the evacuation of English and foreigners from Kabul, the besieged capital of Afghanistan, British Royal Air Force planes made 80 journeys, flying 35,000 mi. with loss of only two machines. About 600 British and other subjects were conveyed to safety without a single casualty.

Premier Mussolini of Italy on July 26 covered 1,250 mi. by flying from Rome to Rimini, calling at Messina and Brindisi, for inspection of naval and military airdromes.

On July 28 a Junkers plane, equipped with a Diesel engine and piloted by Herr Risticz, performed another trial flight and after a 10 hr. cruise safely landed at Dessau.

In order to clarify various reports about the location of the factory in which the Dornier Do X was built, it is emphasized that the giant flying boat was constructed in the German branch plant of the Dornier company at Altenrein, Canton St. Gall, Switzerland.

France to Test Schneider Entries

PARIS (FRANCE)—There may be no French contender in the Schneider Trophy Contest this year. Withdrawal of this country following the fatal crash of one of the pilots training for the event was reported, but the government asserts that definite decision about participation in the contest depends on the outcome of tests of the racing planes specially designed and built for the event. It is said that Lieutenant Bennet's death will not influence this decision.

Gipsy Engine Runs More Than 500 Hr.

LONDON (ENGLAND)—A severe reliability test of considerable interest is being carried out here with a de Havilland Gipsy engine. As this is being written, the test is still in process, the engine having been flown more than 500 hr. under seal and without any repairs or adjustments except for the replacement of a magneto. A temporary halt has been made, however, to permit exhibition of the engine at the Olympia show.

The test was about as follows: An engine was selected at random from production by the Air Ministry inspector at the de Havilland works. It was sealed against any possibility of tampering and installed in a standard Moth. Since then it has been flown daily at an average air speed of 85 m.p.h. The fuel consumption is 4.63 gal. per hour and the oil consumption .5 pint per hour. The company points out that the failure of one magneto would not cause a forced landing.

It is claimed that the engine is running quite as smoothly as a new one, that the oil consumption is not rising and that the compressions are good and even. When the engine had been removed from the exhibition, it was to be returned to the test and a good many more hours of running are expected before any trouble may arise.

National Flying Firm To Open Home Airdrome

LONDON (ENGLAND)—National Flying Services expects to dedicate its headquarters airdrome, equipped with five hangars and shops, at Hanworth Park, near here, early in September. Other airdromes in its proposed chain are being prepared for and at least ten of these should be ready for use this year. The company has announced a plan for giving trial flying instruction for slightly over $10. This will include a short ground explanation of the controls, a practical demonstration of piloting and a few minutes of handling the controls.

Pupils will be transported to the airdrome from London daily without extra charge. The Desoutter three-place cabin plane, the Blackburn Bluebird, the Simmons Spartan and the A.B.C. Robin have been selected as standard flying equipment of the company. Mr. Neville Stack has been appointed chief pilot in charge of the company's flying personnel.

Bullion Carried in Safety

LONDON (ENGLAND)—Transportation of jewels, securities and other valuable cargoes by air is nothing new on European air services but recently Imperial Airways established a record for carrying bullion by airplane. During a nine-day period the last of July, 40 tons of gold bullion valued at about $25,000,000 was transported across the English Channel from this city to Paris.

WHAT OUR *Readers* SAY

Uniform Landing Speeds

TO THE EDITOR:

It was most interesting to learn that you are starting a correspondence section because, more than competition, it has always seemed to me that intelligent *discussion* is the life of trade —and of progress. I'm particularly glad of the opportunity to say a few words in appreciation of Mr. Reid's entertaining article on "Landing Speed," and to add a little to the train of thought he has started.

The lack of scientific uniformity in manufacturers' landing speed claims is most disconcerting. There is apparently no rhyme nor reason to the whole set of figures. In fact the only thing worse that I know of would be a similar plot of the *actual* landing speeds. To be serious now, suppose that in a severely practical spirit we take the real landing speeds instead of those advertised, then the "Heavens in June" would hardly contain the different points represented.

The principal source of discrepancy lies in the one factor that Mr. Reid did not mention (probably because too obvious), the wind speed. And if it should be claimed that the "real" landing speed is relative to the air, I cannot agree. For example, consider a parachute, gliding angle 90°, horizontal air speed zero, but anyone who claims that its landing speed is necessarily zero should make a drop once in a 30 mile wind. He would then be more likely to say that his landing speed was what he actually landed at. The name itself implies a speed over the ground, and its use should be similarly restricted.

Coming back to airplanes, the wind speed of course cannot be predetermined, but a deduction of 10 mi. per hr. average on this score would be closer to the usual facts than an idealized assumption of no wind at all. Furthermore the importance of mere landing speed is commonly overemphasized in comparison with other desirable qualities for landing. The real test is the variety and range of conditions under which a given plane may be safely landed.

To bring some kind of order out of the present confusion, why not encourage the use of a "standard ground wind" of 10 m.p.h. as applied to "landing speed"; and otherwise use the more concise term "stalling speed"?

RALPH H. UPSON
Red Bank, New Jersey

• • •

Mr. Reid Replies to Mr. Upson

TO THE EDITOR:

It is my opinion that Mr. Upson is mistaken in thinking that the *actual* landing speeds of airplanes bear no reasonably consistent relation to the wing loadings. The experimental values presented in the article of reference are offered in support of this view.

If the principal cause of discrepancy is the neglecting of ground wind in making landing speed tests, there should be no difficulty in clarifying the situation. Such tests should be carried out, of course, in as nearly still air as is possible; the period just after dawn is the most suitable time. When tests must be made in light winds a portable anemometer will measure the existing wind speed with satisfactory accuracy.

I agree that most airplane landings are made into winds which may average as high as 10 miles per hour. However, I do not favor the adoption of a "standard ground wind" because all other airplane performance characteristics are referred to still air. I would offer as an alternative for the usual term 'landing speed' the more explicit characteristic "landing air speed."

ELLIOTT G. REID,
Stanford University

[On the specific point at issue we find ourselves in agreement with Professor Reid. While a plane fortunately has some wind to land against in most cases, the pilot must always be prepared to get down in a flat calm. The landing speed in still air must be taken into account as a case sure to be encountered at times. Furthermore, if a "standard wind" were to be adopted it ought to vary with location. Ten miles an hour might be correct for a large part of the United States, but in parts of the West a considerably higher velocity would be normal while a lower figure would be more correct in some of the southern states.—ED.]

Editorial Comment
FROM THE DAILY PRESS

Flying High and Quiet

AIR COMMERCE REGULATIONS were originally drafted to protect human life. The Federal laws forbid pilots to fly lower than an altitude of 1,000 feet over a city or over other temporarily congested districts. The danger from a crash or from the loss of some part of the machine is not so great when the crowd has a chance to scatter. Existing rules may be invoked to prevent the disturbance caused by low-flying planes, usually displaying some kind of advertisement, which have recently hovered over the open-air concerts of the city. Both Mr. Van Hoogstraten and Mr. Goldman have complained of the annoyance of roaring motors when too ambitious pilots displayed their advertisements to the ready-made audiences. On one occasion the former stopped the performance until the rude interruption ceased.

It is not surprising that a pilot in the advertising business should seek a spot thronged with possible prospects to show his brilliant lights. Unless he happened to be unusually thoughtful and foresighted, or if he had no specific instructions from his employer to the contrary, his instinctive choice for a flight would be low over a large gathering of people already assembled by some other attraction. The audiences at the open-air concerts do not like his close approach any better than the directors do, though there is no objection to a streak of red lights in the far distance, especially when it appears, as it did the other night, as an appropriate accompaniment to modernistic music.

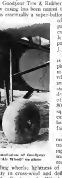
In addition to making use of the safety regulations for prohibiting the noise nuisance of planes, city officials have another means of controlling the annoyance. Airplane manufacturers and airport officials and advertisers using planes have shown themselves eager to cooperate with the Mayor and the Police Commissioner. Though the law requires a minimum altitude of 1,000 feet, persons in charge of pilots are making even stricter rules. An executive order to the managers of all Curtiss flying fields has just been issued, directing all Curtiss pilots to add another thousand feet to the minimum required in any densely populated area. Engineers are working hard to reduce the sound of propellers and motors, and planes will soon travel more quietly. Meantime, the fliers must stay high enough to keep an air blanket between their hum and the roar of the city below.

NEW YORK TIMES

THE BUYER'S LOG BOOK

Goodyear "Air-Wheel"

AN AIRPLANE tire of radically new design has been perfected and is being placed on the market by the Goodyear Tire & Rubber Co. of Akron, Ohio. The new casing has been named the Goodyear "Air-Wheel." It is essentially a super-balloon tire for airplanes, being of great thickness when compared to its diameter, and carrying a low air pressure. It was developed by the company in cooperation with A. J. Musselman.



Installation of Goodyear "Air Wheel" on plane

One of the standard sizes is 22 x 10 in., taking the place of the familiar 30 x 5 in. aircraft tire. This tire, when inflated to 20 lb. pressure is designed to sustain a static load of 1,600 lb. Under these conditions, the area of contact with the ground is 80 sq. in., compared to 32 sq. in. for the 30 x 5 in. casing. Thus the new tire has about 2.5 as much surface in contact.

Advantages which engineers claim for the air-wheel tire include extreme cushioning for landings, traction in snow, ice, sand and mud; increased streamlining for landing wheels; lightness of weight, and increased security in cross-wind and deflated tire landings.

The Goodyear Air-Wheel is a tire which requires no wheel upon which to be mounted. That is, the casing is fitted directly to the hub. Brakes can be included as part of the hub without depreciation of the equipment's streamline advantages, but with a slight increase in weight. Hubs are furnished by the manufacturer either with or without brakes. The brake mechanism is of the internal-expanding type, pressure being supplied to the inside surface of the hub. The wheels can be braked independently to facilitate turning.

For several months, exhaustive tests have been conducted with the Air-Wheel at the Akron Municipal Airport and elsewhere. The tire, in spite of its rather great cross-sectional area, is said to create less air resistance than ordinary types, due to its better streamlining.

It might seem that a tire of such great thickness, measured from the hub to the tread, would give an unusually great drop when punctured. However, this drop on the 22 x 10 in. tire is only 1.5 in. greater than on the higher pressure 30 x 5 in. casing. This leaves ample room for propeller clearance.

The Goodyear Air-Wheel tire is available in several sizes. The smallest is a four-ply 12 x 5 in. casing which fits a 3 in. hub, and which is intended to replace small size high pressure tires. The 16 x 7 in. tire is also four ply and takes a 3 in. hub. It is to replace larger tail wheels of present high-pressure or solid type, and should eliminate shock-absorbing devices.

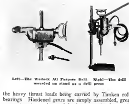
The 22 x 10 in. casing is designed to replace the largest tail wheels of the present type and to be used on front wheel mountings from the smallest high pressure size to those using 30 x 5 in. On smaller planes this permits pressures as low as 3 lb. per sq. in., with resulting better shock absorption.

Larger sizes are 30 x 13, 37 x 16 and 46 x 20 inches. The last-named size will carry 7,500 lb. at 35 per cent deflation, the recommended working conditions, where the pressure is 20 lb.

Wodack All Purpose Drill

A NEW "Wodack" all purpose ⅜ in. electric drill has been announced by the Wodack Electric Tool Corp., 4627 West Huron St., Chicago. This tool like other Wodack models can be mounted on a tool stand, also furnished by the company, producing a bench drill.

A General Electric motor of ample reserve power is built in for direct or alternating current of 60 cycles or less, 110-125 or 220-250 volts as desired. An oversize double pole trigger switch is placed in convenient position. High grade ball and roller bearings are used, the heavy thrust loads being carried by Timken roller bearings. Hardened gears are simply assembled, grease compartments are designed for long periods of operation and good ventilation is provided by an oversize fan for quick cooling during idle running.



Left—The Wodack All Purpose Drill. Right—The drill mounted on stand as a drill press

The capacity of the tool in steel is 0-⅜ in. and in wood, 0-2 in. depending on type and depth required.

Air Associates Catalogue

CATALOG No. 9, recently issued by Air Associates, Inc., Garden City, N. Y., contains a complete listing of aeronautical equipment for a variety of purposes. This catalog, which is 58 pages in length, contains information and prices on equipment for the individual flyer, airport or airline operator, and the manufacturer of aeronautical products. It is available on request.

SIDE SLIPS

By
Robert R. Osborn

IT SEEMS TO US that the sponsors and fliers of the St. Louis Robin took a long chance of having their wonderful endurance record declared unofficial So far as we have been able to find out from the papers they didn't use either a second-hand motor or a rebuilt airplane

• • •

From the stories of the endurence flight, the pilots of the Curtiss Robin seemed to have given their motor a complete top overhaul and to have made regular inspections of the outside of the ship back to and including the tail surfaces If they had only found it necessary to repair the landing gear and to have changed propellers while in flight, they could have taken all championships away from the California fliers The Californians lost their endurance record by a good eight-day margin but still have the landing gear-repairing championship

• • •

"EARLY BIRD GETS THE WORM," we think would have made an excellent headline for the news items concerning the recent forced parachute jump of "Dick" Depew, one of the directors of the Early Birds

• • •

Incidentally, as a result of his experiences in this jump Dick is recommending that oleo-rubber heels be supplied with all parachutes in the future. It seems that there was so much rebound from the plain O'Sullivan heels that he made a second landing, which turned out to be a three-point one, and the third point has been somewhat disabled ever since

• • •

Once again we are forced to admit that possibly we were a bit forehanded when we laughed so sarcastically at the New York stock broker's advertising literature about the air-cooled motor with the eighty mile an hour top speed and the twenty five mile an hour landing speed Our latest set-back comes in the clipping sent in by Mr E M of Tucson, Arizona, from the Tucson *Daily Star*

"Culver City, Calif., July 12 (AP) —Ten days and a quarter aloft, a new epic of the air, was written here today when the wheels of a second-hand Wright Whirlwind motor touched the ground."

• • •

Mr H P of New York sends in the clipping

'In instructing a student to come out of a bank and fly straight the usual signal is a wiggle of the finger to right the wing and both hands held straight up and parallel The instructor indicates that he wants the controls by tapping himself on the head"

And he encloses this comment:

"I arise to comment that there are occasions when the instructor taps the student on the head to indicate he wants the controls, regardless of your recent insistence that pilot instructors don't carry blackjacks."

• • •

The following sad story from E.H P of Spokane, Wash, is published as a warning to all other aeronautical enterprises which might be considering radio advertising

"The Mamer Air Transport Company of Spokane is not going to put on any more all-request radio musical programs without scanning the numbers to be played. On one occasion recently the company got these two mixed in with its appeal for passengers 'I'm Waiting For Ships That Never Come In' and 'I've Got A Feeling I'm Falling'"

• • •

The foregoing item about an airplane company advertising by radio reminds us of a parallel incident at one of the eastern fields We were sitting in front of a hangar with an Old Timer,—one of the "flying since 1912 boys," when a ship passed overhead with an advertisement painted on its lower wing and with a siren hooting away at a great rate "Too bad," said the Old Timer, with tears in his eyes, "to think that flying and airplanes have now become so common that they have to blow horns to attract attention"

• • •

Mr. E.P W. calls a news item to our attention which tells of a flying course about to be started at a girls' school which certainly will be unique, as 'all pupils at all times will be accompanied by a chaperon"

Mr E.P W sends the following note with the clipping "It suggests questions as to whether (1) the chaperon referred to is to circle overhead in a pursuit plane, or (2) Lo, the poor designer of training airplanes will have to produce triple-control three-seaters henceforth One wonders (3) whether equally good results would not be obtained by fitting Gosport tubes with language strainers, and finally (4) reflects that the silly season may begin on April 1st, but does not end then"

• • •

All of the suggestions made by Mr E P W have some possibility of being the solution of the problem before the house, but they all have some draw backs If the chaperon is to be in another ship we would suggest an OX Jenny with one cylinder cutting out badly—which would direct most of her attention to her own ship The triple-control three-seater has at least one good point in its favor—the instructor could claim at any time that the chaperon was freezing on the controls and neatly eliminate her with the fire extinguisher The language strainer would be impractical, as it would just about eliminate all of the pilot's conversation. The student wouldn't get much out of this for instance, "Hey ——— ——— ——— ———, what the ——— the idea of sticking the ——— wing in the ——— ——— ground? And I want you to pull that ——— ——— stick back in your ——— ——— ——— when you land this ——— ——— — ———"

Our idea would be to have the chaperon in the stowaway section of the ship (she should be about as popular as most stowaways are) and have her officially sealed by the N A A before starting the flight

• • •

The Society For the Aeronautical Education of Artists and Newspaper Correspondents will have a special meeting as soon as the other member can reach our office. One of the popular five-cent weeklies has started to feature airplane pictures on its cover and the latest effort, which we have before us, can be described briefly as follows A group of three are seated in a cabin ship flying at about five hundred feet over green fields The pilot (whose face is strangely familiar) is wearing a heavy furlined and fur-collared leather flying suit, heavy leather helmet and goggles Beside him sits a young lady wearing light clothes and a light summer fur Behind the pilot sits a young man in a business suit and wearing a student's speaking tube helmet.

The special meeting will consider asking Congress to pass a law

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AVIATION

The Oldest American Aeronautical Magazine

August 17, 1929

AERONAUTICAL ENGINEERING SECTION

CONTENTS

Weight Control IN THE DESIGN OF AIRCRAFT

By Fredric Flader
Consolidated Aircraft Corp

THERE are two factors predominating in the performance of a heavier-than-air craft These are its aerodynamic form and its weight The designer of a successful airplane, which must be one of superior performance, is confronted primarily with the incorporation of aerodynamic excellence into the design and with the securing of the lightest structure possible, consistent with the necessary safety requirements

It may be established that a unit of weight in an airplane is equivalent in its effect on any particular measure of performance, to a definite amount of resistance in terms of equivalent flat plate area The equivalent of weight to resistance is variable with the speed of the machine and its altitude of operation For high speed aircraft a larger increase of weight is permissible for a given reduction in resistance than is the case for a plane of lower speed. In the design of racing aircraft, the reduction of resistance is very important and a greater proportionate increase of weight may be expended to achieve this than in other types of aircraft It appears then that in most designs not of the strictly high speed type, the reduction of weight may be more important than the minimizing of resistance. Also, at altitudes the importance of weight increases The extra resistance of an aircooled engine at low altitudes outweighs the weight saving it makes possible. At high altitudes, however, this position is reversed It is known that the performance of certain types of aircraft equipped with aircooled engines is definitely superior to the same type provided with water cooled power plants when operated at high altitudes

The designer must determine through performance calculations, the importance of weight as opposed to resistance for the particular aircraft engaging his attention Having done so he must then consider the urgency of having his airplane built according to the weight requirements laid down in the preliminary stages of the design Laxity in the accurate prediction of the weights of the component parts of the airplane in the design stage leads to very undesirable effects An airplane may be designed to transport a definite useful load, and if, as frequently happens, the dead weight of the plane exceeds the value used in the stress analysis, a serious reduction in the safety factor may occur. This may reduce the structural safety below the requirements which are definitely fixed by the civil or military authorities If no reduction in the safety requirements is permissible, a reduction in useful load equal to the amount of overweight must be suffered There are instances in which both civil and military planes of ordinary size have been built which have been 500 or more pounds overweight A military type designed for a maximum load factor of 12 on the wings may actually be subjected to a load factor of 8 in a severe maneuver If its designs is based on a gross weight of 3,000 lb, and it is 500 lb overweight, it may be subjected to a load factor of 8 based on its actual weight of 3,500 lb. The safety factor for a plane weighing 3,000 lb would be only $12/8 = 1.5$, and for the plane which is 500 lb overweight the safety factor would be roughly

$$\frac{3,000 \times 12}{3,500 \times 8} = 1.29$$

a very serious reduction in safety. Not only is the safety factor reduced by overweight but also the expected performance suffers correspondingly In the case of a civil aircraft, the reduction in useful load in any considerable amount precludes the possibility of the airplane competing successfully with well engineered contemporaries

The effective control of weight during the design and construction of aircraft requires the constant application of rather meticulous care and attention to detail. It will usually be necessary to assign at least one person from an engineering department to the task, whose time will be entirely taken by it

The method of weight control used by the Consolidated Aircraft Corporation in connection with the development of the Admiral PY-1 Navy Patrol Flying Boat involves the following procedure:

1 Estimated Weight Statement

A preliminary "weight estimate" of the dead weight should be made of all the component parts of the airplane by the designer This should be done by the use of a standard form which properly lists all of the principal units of the airplane weight, together with a tabulation

WEIGHT STATEMENT

Airplane Model ______ Manufacturer ______

STRUCTURE

SURFACES	Center Section	Outer Panels	Ailerons	Stabilizer	Elevator	Fin	Rudder
Beams							
Drag Truss Compression Members							
Drag Truss Tension "							
Ribs							
Leading & Trailing Edges							
Tip Structure							
Nose Covering							
Fittings							
Secondary Structure (Auxiliary beams, braces, etc.)							
Supports for Controls							
Supports for Equipment (Navigation, landing, etc.)							
Windows & Walkways							
Bolts, Nuts & Rivets							
Paint & Varnish							
Covering & Dope							
Control Arms & Horns							
External Struts							
External Wires							
Miscellaneous							
TOTALS							

FUSELAGE	Fuselage	Landing Gear	Tail Skid or Wheel	
Fuselage Frame				
Struts				
Wires				
Fittings				
Engine Mount Frame				
Supports for Seats Flooring, windows & Other furnishings				
Supports for Cowling Turtle Back & Fairings				
Steps, grips & Walks				
Bolts Nuts & Rivets				
Paint				
Covering, including Paint & Dope				
Miscellaneous				
LANDING GEAR				
Axles				
Struts				
Wires				
Fittings				
Wheels & Brakes				
Brake Operating Mechanism				
Shock Absorber				
TAIL SKID or WHEEL				
Tail Skid Structure				
Tail Skid Shoe or Wheel				
Tail Skid Shock Absorber				
Tail Skid Steering Control				
Fairings				
Bolts, Nuts, Rivets				
Paint				
TOTALS				

Table 1

POWER PLANT	Engines	Cooling	Fuel	Oil	
ENGINES					
Engines (dry) without hub					
Accessories					
Exhaust System					
Heater Including Piping					
Starter Including Booster Magneto, Crank or other Accessories					
Fire Extinguisher & Control					
Propeller, Including Hub Bolts, Nuts Etc.					
COOLING SYSTEM					
Radiator					
Shutters					
Expansion Tank					
Piping & Fittings					
Water (radiator Water Piping, etc)					
FUEL & OIL SYSTEM					
Main Fuel Tanks					
Gravity Fuel Tanks					
Fuel Piping					
Fuel System Fittings (including strainers, valves, pumps, etc.)					
Oil temperature regulator					
Oil Tank					
Oil Piping & Fittings					
Supports & Bracing					
Paint & Varnish					
TOTALS					

FIXED EQUIPMENT	Instruments	Elevator	Rudder	Ailerons	Stabilizer	
Instruments						
Airspeed Indicator & tubing						
Turn indicator Venturi & tubing						
Altimeter						
Compass						
Inclinometer						
Clock & Mount						
Water Thermometer & Tubing						
Oil Thermometer & Tubing						
Oil Pressure Gauge & Tubing						
Fuel level gauge & accessories						
Tachometer & Shaft						
Controls						
Control Sticks or wheel column Assembly						
Rudder bar or pedal assembly						
Rocker Arms & Connecting Tubes						
Cables, guides & Pulleys						
Stabilizer Adjusting Gear (incl'g. rods, cables, chain, etc)						
Struts & Wires						
Supports & Bracing						
Bolts, nuts, rivets						
TOTALS						

Table 1 (continued)

FIXED EQUIPMENT (Cont'd.)	Seats & Flooring	Instrument Bd Windshield Baggage Comp.	Electric Equipment
Seats & Supports			
Pilots			
Passengers			
Flooring & Supports			
Cockpit & Cabin			
Walks			
Instrument Board & Supports			
Windshield & Support			
Baggage Compartment & Lockers			
Electrical Equipment			
Ignition Switch, Wiring, Etc.			
Generator			
Generator Control Box			
Battery & Box			
Electrical Instruments			
Navigation lights wiring, etc.			
Landing lights wiring etc			
Cabin lights, wiring, etc			
Panels, Switches			
TOTALS			

SUMMARY	
Structure	
Power Plant	
Fixed Equipment	
Total Weight Empty	

Table 1 (concluded)

TABLE II

PART		FLANGES: HORIZONTALS	FLANGES: REINFORCEMENTS: OUTSIDE COMP FLANGE	FLANGES: REINFORCEMENTS: INSIDE BOTH FLANGES	FLANGES: SPLICE PLATES	WEB: WEB PLATE AT STRUT FITTING	WEB: GUSSETS	WEB: CHANNELS	WEB: SPACERS	FITTINGS: STRUT ATTACH	FITTINGS: INSER END	BOLTS NUTS & RIVETS	PROTECTIVE COATING	WEIGHTS: TOTAL COMPUTED	WEIGHTS: ACTUAL	WEIGHTS: % ERROR
FRONT BEAM	DESCRIPTION	[illegible] Tee	[illegible] Sheet	[illegible] Sheet	[illegible] Plate	.064 Sheet	.064 Sheet	[illegible]	[illegible]	[illegible] Sheet Steel	[illegible] Sheet	[illegible]				
	LENGTH AREA or VOL.	930 Inch	679 Sq in / 609 "	323 Sq in	13.5 Sq in / 11.25 "	92.2 Sq in	537 Sq in	[illegible]	63"	61.66 Sq in	26.25 / 8.51	[illegible]				
	UNIT WT.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
	WEIGHT	78.25	6.5 / 4.93	6.13	.36 / .30	5.97	3.62	7.19 / 7.07 / 2.36	1.98	1.60	.59 / .37	[illegible]	[illegible]	124.4	128	2.9%
REAR BEAM	DESCRIPTION	[illegible] Tee	½ Sheet	[illegible] Sheet	[illegible] Plate	[illegible] Sheet	[illegible] Sheet	[illegible]	Same as front Beam	Same as front Beam	Same as front Beam	Same as front Beam				
	LENGTH AREA or VOL.	956 Inch	595 Sq in	378 Sq in	13.5 Sq in / 10.32 "	918	436	1598								
	UNIT WT.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
	WEIGHT	77.90	7.85	5.22	.392 / .281	3.28	2.46	15.72	1.95	1.61	1.17	3.03	[illegible]	124.25	128.00	2.93%

Note Material is Alum Alloy unless otherwise specified

A table showing the general method of weight computation from drawings

TABLE 3

Group	Part	Description	Length, Area or Vol.	Unit Wt.	Comp. Weight
Drag Truss — Compression Members	Truss Chords & Webs	1 x 3/16 x 1/16 Bulb Angle	3156 ins	[illegible]	39.10
Drag Truss — Compression Members	Reinforcement	.040 Sheet	22.87 sq ins	[illegible]	.31
Drag Truss — Tension Members	Tie Rods & Clevises	3/16 [illegible] Tie Rods	8 98 1/2" Long; 8 92 1/2" "; 12 47 7/8" "	.0091 [illegible]	6.93; 6.67; 10.45
Drag Truss — Fittings	Gussets; Reinforcements	.093 Sheet; " "	273 sq ins; 107 " "	1.35 #/sq ft	2.58; 1.30
Rib	Std. Rib; Rib at Aileron	1/2 x 1/2 x .020 Channels & Fittings	13 Reqd; 17 "	[illegible]	29.90; 36.60
Leading Edge	Leading Edge Strip	3/4 x 3/4 x .064	436 ins	.175 [illegible]	6.65
Leading Edge	Leading Edge Covering	.020 Sheet	115.8 sq ft	.282 #/sq ft	32.60
Leading Edge	Reinforcements	.020 Sheet	68.48 sq in	.282 #/sq ft	1.35
Wing Tip	End Bow	1 1/2 .065 Tu.	100 in	.356 [illegible]	2.96
Wing Tip	Covering	.020 Sheet	12.76 sq ft	.282 #/sq ft	3.72
Trailing Edge	Normal	3 1/2 x .030 Sht	235 ins	[illegible]	2.56
Trailing Edge	Aileron Sec. (Upper)	3 1/2 x .030 Sheet	261 ins	.123 [illegible]	2.68
Trailing Edge	Aileron Sec. (Middle)	5/8 x 5/8 x .064 Angle	261 ins	.097 [illegible]	2.11
Trailing Edge	Aileron Sec. (Lower)	3/4 x 1/2 x 1/16 Bulb Angle	261 ins	.126 [illegible]	2.74
Aileron Hinge Brackets	Hinge Arms	1/8 Sheet	387.68 sq in	[illegible]	7.78
Aileron Hinge Brackets	Attach Angles	.093 Sheet	105.18 sq in	1.35 #/sq ft	.99
Aileron Hinge Brackets	Gussets	.093 Sheet	61.25 sq in	1.35 #/sq ft	.57
Paint					2.00 Est.
Wing Covering	Fabric	Fabric Tape Sewing & Dope	396.5 sq ft Wing Panel	.215 #/sq ft	25.49
Weights	Computed				[illegible]
Weights	Actual				[illegible]
Weights	% Error				[illegible]

Note All material is Alum. Alloy unless otherwise specified.

Summary Item	Computed Wt.	Actual Wt.	% Error
Front Beam	134.09	138	
Rear Beam	128.25	128	
Other Structure	[illegible]	292	
Total Wing Panel	[illegible]	[illegible]	[illegible]

A general table of wing part weights used in the method of computation

of the components of the principal units. The various items should be listed in quite complete detail so as to preclude the possibility of overlooking anything when making up the weight estimate.

A suitable form is given here to show the detail in which the weight estimate should be made. The principal units—structure, power plant and fixed equipment should always be used. So far as is known, these divisions are applicable to all types of heavier-than-air craft.

The tabulation of weights may be altered to suit individual designs. The above statement is suitable for the conventional single engined land plane type.

2. *Computed Weight Empty* from the Detail and Assembly Drawing of the Airplane.

The weight empty is the total of Structure, Power Plant and Fixed Equipment. The gross weight is the sum of Weight Empty and Useful Load. It should not be necessary to compute the weights of Useful Load items as these are usually fixed by the specification of the aircraft and are known beforehand.

The computation of the weights from the drawings should be made by the draftsmen making the drawings. These may be done when the drawings are completed in sufficient detail to enable reasonably accurate computations to be made. Later the computations should be checked by the person assigned to weight control, at which time any changes which may have been made in the final drawings may be taken into account.

Weight computations are made simply by computing the volume of material in each part as shown by the drawings, and the volume then multiplied by the unit weight of the material from which the part is to be made. These computations are somewhat tedious but should be made carefully as this is the most important part of the whole procedure. Time can be saved by the use of the planimeter and slide rule.

In the concluding part of this article several tables are given of the unit weights of materials and of the weights of various parts and fittings in general use on present day aircraft.

The computed weights should be assembled and tabulated in a form corresponding to the one used in the estimated weight statement. During the time when the calculated weights are being made, comparison should be made of the various weights with the corresponding items in the estimated weight statement. In the event that these comparisons show that any items are more than five per cent overweight, there should be a corresponding saving in weight on some other item, or the part should be redesigned to bring it down to the desired weight. The final computed weight empty should agree with the estimated weight empty within 3 per cent.

At this point in the procedure it is necessary to check carefully the computed weight statement for omissions. It is very difficult to anticipate and allow for the weights of numerous small items which are a necessary part of the plane. The aggregate weight of all of these items may be a considerable amount and due allowance should be made for them. Particularly, allowances should be made for all items of equipment and for the necessary brackets and fittings to support them. Frequently the weight of power plant parts such as fuel and oil lines and fittings and tank supporting members are not accounted for in sufficient detail. Also, due account should be taken of finishes such as paint, varnish and waterproofing.

Usually the design of some parts will have to be changed to lighten them, without sacrifice of strength. Occasionally, if a serious increase in weight is apparent, and it is not possible or practical for economic reasons to lighten the parts, it will be necessary to revise the estimated weight, and the stress analysis to correspond to the new estimated weight. This in turn involves the

drawings of structural parts which may be changed. The latter procedure, however, will seldom be necessary to any great extent, if a careful estimated weight is prepared by an experienced engineer in the beginning.

Tables 2 and 3 show the general method of weight computations from drawings, together with comparisons with actual weights obtained of the completed units.

3. *The Actual Weight Statement*

While the airplane is being constructed, the parts and assembled units should be weighed as they are completed. On experimental work, this is best done by the person in the engineering department who is assigned to weight control. It is necessary for this man to keep in close touch with the progress of the work in the factory so as to obtain a complete record of all weights. If this is not done, parts will frequently be found assembled to the plane in such a manner as to make it impractical to obtain their weights. Close cooperation of the factory personnel with the engineering department is essential in this respect.

When parts are weighed, it is necessary for the man who is doing the weighing to set down on the record an accurate description of the part or assembly as weight. This is essential because some parts may not be assembled to the unit being weighed, and if a record of the condition of the assembly is not made confusion will result at a future time when the actual weight statement is being prepared.

Example:

9C01—Control Stick Assembly Complete, or

9801—Control Stick Assembly Complete except grip and mounting bolts.

The actual weight statement should be made on a form corresponding to the ones used for the estimated weight and the computed weight statements. Comparisons may then be made to determine the agreement between the actual weights and the computed weights, and if the engineering and weight control work has been carefully done, an agreement between these within 3 per cent may be expected.

The procedure advocated here adds some expense in the designing and building of a new airplane. However, it is probably the only way that guesswork can be eliminated insofar as the weight of a new aircraft is concerned. Its cost may be saved many times in the prevention of overweight with the resultant loss in performance or useful load.

A compilation of weight information on the parts and materials used in the construction of aircraft will be included in the second and concluding article of this series by Mr. Floder.

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Patent No. 1,720,576—Stabilizing Device for Aircraft. Philip D. Stead, Norfolk, Va. One claim.

Patent No. 1,720,661—Control Mechanism. Daniel J. Brumm, Jr., West Hempstead, N. Y., assignor to Ireland Aircraft, Inc. Two claims.

Patent No. 1,720,698—Seaplane. Ludwig Staiger, Birkenwerder, near Berlin, Germany, assignor to the Firm: Rohrbach Metall-Flugzeugbau G.m.b.H., Berlin, Germany. Fourteen claims.

Patent No. 1,720,846—Flying Machine. Alonzo C. Mather, Chicago, Ill. Four claims.

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Patent No. 1,722,467—Dusting Apparatus. Thomas H. Huff, Ogdensburg, N. Y. Assignor to Keystone Aircraft Corporation. Fourteen claims.

Patent No. 1,722,821—Valve-Operating Mechanism. Arthur Nutt, Kenmore, N. Y., Assignor to Curtiss Aeroplane and Motor Company. Twelve claims.

Patent No. 1,722,888—Gyroscopic Compass. Henri Beghin and Paul Monfraix, Paris, France. Two claims.

Patent No. 1,720,667—Aeroplane Construction. Melvin E. Dare, Detroit, Michigan. Eight claims.

Patent No. 1,720,939—Flying Machine. George W. Wilkin, Grangeville, Idaho. Seven claims.

THE *Induced Drag* VIEWPOINT OF PERFORMANCE

By Clark B. Millikan
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THE subject of airplane performance from the point of view of the modern theory of induced drag has been very popular lately and has been treated in several recent papers[1] The present communication does not furnish any results which are in principle new, but rather presents some of the standard formulas in a new form which is felt to have definite advantages, both in exhibiting the essential physical elements in performance, and also in making it easy for the designer to utilize the results A certain amount of repetition of previous work is unavoidable, but this will be made as brief as possible

The usual assumptions are adopted, namely that the lift equals the weight of the plane and that the absolute coefficient of parasite drag is constant throughout the flying range We include in the parasite drag both the so-called structural and also the wing profile drag The ft, lb, sec system is used unless otherwise specified

If h is the altitude the fundamental equation of performance may be written

$$\frac{dh}{dt} = 550\,\frac{Hp_a - Hp_r}{W}, \qquad (1)$$

where dh/dt is the rate of climb in ft/sec, Hp_a is the thrust horsepower available, Hp_r is the thrust horsepower required, and W is the weight of the plane. Since the left side of (1) is a velocity it is convenient to introduce (following Schrenk)

$$w_s = 550\,Hp_r/W, \qquad w_h = 550\,Hp_a/W \qquad (2)$$

w_s is the familiar sinking speed and is the vertical speed of descent of the plane with power off, w_h represents the rate at which the plane would gain altitude if all of the thrust power available were utilized in lifting the plane vertically, and may be called the "rising speed" Note that both are in ft/sec. Then (1) may be rewritten:

$$dh/dt = w_h - w_s \qquad (1')$$

Formulas for w_s (Power Required)

From the definition of w_s we have

$$w_s = \frac{DV}{W} = \frac{D_p + D_i}{W}\,V, \qquad (3)$$

where D = total drag, D_p = parasite drag, D_i = induced drag (all in pounds), and V = velocity of flight in ft./sec It is a well known result of the Prandtl wing theory that

$$D_i = \frac{W^2}{\pi \frac{\rho}{2} V^2 (kb)^2}$$

where ρ = density of the air and kb = equivalent monoplane span[2] If we write f = "equivalent flat plate area" then

$$D_p = 1.28\,\frac{\rho}{2}V^2 f = 0.64\,\rho\,V^2 f$$

Substituting these expressions into (3) we get

$$w_s = 0.64\,\rho\,\frac{f}{W}V^3 + \frac{1}{\pi\,\rho/2}\,\frac{W}{(kb)^2}\,\frac{1}{V},$$

or, writing σ = relative density of the air referred to sea level ($\rho_s = 0.00238$), and defining

$$l_s = \frac{W}{(kb)^2} = \text{span loading}^3$$

$$l_p = \frac{W}{f} = \text{parasite loading},$$

we arrive at the simple relation

$$w_s = 0.001523\,\frac{\sigma}{l_p}\,V^3 + 267.5\,\frac{l_s}{\sigma}\,\frac{1}{V} \qquad (4)$$

This expression is very interesting Neglecting altitude effects for the moment, it shows that at a given velocity the sinking speed (or Hp_r) at sea level depends on two aerodynamic parameters only namely the span and parasite loadings Span loading has not been a much used parameter in this country, but in Europe and especially England it is very often referred to in place of aspect ratio as a criterion in the comparison of planes It has proven very useful in this connection and its physical importance as indicated by equation (4) shows that it merits a more general use in this country With regard to the other parameter in (4), namely the parasite loading, it has most of the merits of span loading except that of general usage. It has been mentioned in one or two papers, but as far as the author is aware, has not as yet been used by the practical designer It is obviously analogous to such more common parameters as "equivalent flat plate area," "parasite drag coefficient," and "parasite L/D," but seems to have advantages over all of these quantities

Introducing rough average values, say $l_s = 2.5$ and $l_p = 300$, into (4) the relative importance of the two parameters under various conditions is very clearly exhibited Consider three average conditions: $V = 80$ ft/sec (stalling speed), $V = 110$ ft/sec (cruising speed, speed for best climb), and $V = 200$ ft/sec (high speed) Then the expressions for w_s are as follows

$$\begin{aligned} w_s &= 2.6 + 8.4 && \text{(stalling speed)}\\ w_s &= 6.8 + 6.1 && \text{(speed for climb)}\\ w_s &= 40.6 + 3.4 && \text{(high speed)}, \end{aligned}$$

where the first terms correspond to the first term of (4) and the second to the second term of (4) We have assumed sea level conditions, i e, $\sigma = 1$ We see that at stalling speed the term involving span loading has over three times the importance of that involving parasite loading, at cruising speed or speed for best climb the two terms are roughly equal while at high speed the parasite loading far outweighs the span loading term The same relative importance of span and parasite loadings for these three conditions will be found to hold approximately for all normal planes, and it is extremely important for the designer to have them well in mind For long distance or altitude planes or for planes designed to fly economically at cruising speed he must pay attention to both terms, i e, he must make the parasite loading as large as possible and the span loading as small as possible For high speed planes, on the other hand, he may concentrate his attention primarily on making the parasite loading as large as he can

Some interesting deductions as to altitude effects can also be drawn from (4) As altitude increases σ decreases and hence at constant speed the first term in w_s decreases while the second term increases. Hence the net result on w_s depends on which of the two terms is the dominant one At high speed w_s (and hence Hp_r) decreases with altitude at constant speed Near stalling speed w_s increases as the altitude is increased, V remaining constant If the speed is maintained near to the value for best climb at sea level and the altitude is increased w_s and Hp_r remain nearly constant

It is of some interest to have explicit expressions for w_s at certain special conditions, and this involves getting expressions for the forward velocity V under these conditions We shall briefly consider the two conditions of maximum overall L/D (denoted by the subscript L) and minimum sinking speed or power required (denoted by the subscript P) From the condition that L/D be a maximum it can easily be shown that $C_{Dp} = C_{Di}$, and from this relation the following expression for the flying velocity at maximum L/D may be deduced (The details of the analysis are not given since Driggs's paper previously mentioned contains them in a different form)

$$V_L = \frac{1.00}{\sqrt{\rho}}(l_s l_p)^{1/4}\ \text{(ft/sec)}, \qquad (5)$$

or introducing the relative air density and expressing V_L in m p h

$$V_L = \frac{14.0}{\sqrt{\sigma}}(l_s l_p)^{1/4} = \text{Vel. for max. } L/D \text{ in m.p.h} \qquad (5')$$

Similarly for minimum power required the relation exists $C_{Dp} = \frac{1}{3}C_{Di}$ and from this we obtain for the velocity at which minimum power is required

$$V_P = \frac{0.758}{\sqrt{\rho}}(l_s l_p)^{1/4}\ \text{(ft./sec)}, \qquad (6)$$

or

$$V_P = \frac{10.6}{\sqrt{\sigma}}(l_s l_p)^{1/4} = \text{Vel. for min. power required in m p h.} \qquad (6')$$

The well known result appears that $V_P = .76\ V_L$, i e, the velocity for minimum power required is 0.76 times the velocity for maximum L/D, or the velocity for smallest sinking speed is 0.76 times the velocity for best gliding angle

We can now substitute (5) and (6) into (4) and find the sinking speed for these two conditions We get in this way

$$\left.\begin{aligned} w_{sL} &= \frac{26.1}{\sqrt{\sigma}}\left(\frac{l_s^3}{l_p}\right)^{1/4} = \text{sinking speed at max. } L/D \text{ (ft./sec)}\\ w_{sP} &= \frac{22.9}{\sqrt{\sigma}}\left(\frac{l_s^3}{l_p}\right)^{1/4} = \text{minimum sinking speed (ft./sec)} \end{aligned}\right\} \qquad (7)$$

The relation between the two quantities is

$$w_{s\,min} = 0.88\,w_{sL}$$

From (7) the horsepower required for a particular plane at the two conditions can of course be calculated using (2).

Considerations Involving w_h (Power Available)

Our considerations so far have been concerned entirely with the power required part of performance For any performance prediction or analysis for power driven planes the above results must be combined with power available data The most desirable thing would of course be to develop an analytical expression for w_h as a function of V, analogous to equation (4) for w_s. Unfortunately it has been impossible as yet to find any such accurate analytical formula which is general and yet simple enough to be of practical service The number of variables involved is too large, including both engine and propeller characteristics, and at least in the case of those associated with the latter, the available information is essentially empirical and tabular in nature rather than theoretical and analytic This is the reason why the power available portion of any accurate performance estimation is almost universally tabular or graphical in nature, and this in turn makes it practically inevitable that the power required portion of the analysis be expressed in the same form This would appear to detract considerably from the importance of an analytic expression such as (4), at least in routine accurate performance estimation However, even for such work it is probably at least as simple to plot a curve for w_s or Hp_r from equation (4) as to plot the curve from a table of computed values in the normal manner There is also some advantage in using curves of w_s and w_h, *vs*, V, instead of the customary Hp_r and Hp_a, *vs*, V, since in this way rate of climb instead of excess horsepower is read directly from the chart

It should be mentioned in this connection that several attempts have been made to develop an analytical expression for w_h Schrenk in particular (loc cit) has considered the question in detail and has developed several interesting approximate expressions However, in view of the difficulties mentioned above, the practical usefulness of these formulas seems doubtful, at least until engine data is available in a more general and analytical form than at present

Level High Speed

In spite of the difficulties enumerated above in combining Hp_r and Hp_a so as to get rational expressions for complete performance, there is one instance in which such a combination can be effected satisfactorily This is the case of full speed level flight, for at this condition the brake horsepower available is assumed to be the rated full load power of the engine = Hp, and the

[1] cf in particular M Schrenk, NACA Tech Mem 456, 477, and Ivan H Driggs, Aviation (Engineering Supplement) Jan 19 1929

[2] b = maximum span k = Munk's span factor = 1 for monoplanes For biplanes k is conveniently given in Diehl's "Engineering Aerodynamics" p. 36 42

[3] In this country the quantity $W/(kb)$ is sometimes called span loading but the European and British notation adopted here seems preferable since $W/(kb)^2$ is proportional to induced power required per pound of weight supported, and is therefor a true measure of aerodynamic efficiency Our notation is also rendered symmetrical by this choice since both l_p and l_s have now the dimensions lb/sq ft

propeller efficiency is generally the "design maximum efficiency" and can be estimated quite closely. Hence the thrust power available, which is the product of these two, is known and an analytical expression for the velocity can be determined.

In this case, then, the fundamental equation of performance (1') takes the form

$$w_h - w_a = 0,$$

in which w_a is given by (4) with $V = V_m = V$ maximum, and

$$w_h = 550\ \frac{Hp \times \eta}{W},$$

where Hp = design brake horsepower of the engine and η = design maximum propeller efficiency. If now to save writing we introduce a new parameter

$$l_t = \frac{W}{Hp \times \eta}, \qquad (8)$$

which we shall call the thrust power loading, then the equation for high speed takes the form

$$\frac{550}{l_t} - 0.001523\ \frac{\sigma}{l_p}\ V_m^3 - 267.5\ \frac{l_s}{\sigma}\ \frac{1}{V_m} = 0,$$

or

$$V_m^3 = \frac{361{,}100}{\sigma}\ \frac{l_p}{l_t} - \frac{175{,}600}{\sigma^2}\ \frac{l_p l_s}{V_m} \qquad (9)$$

This fourth degree equation for V_m does not look very inviting, but there is a redeeming feature which appears if average numerical values are inserted in the equation. For then it is seen that the second term on the right-hand side is very small compared to the first term (something of the order of 5 per cent to 10 per cent), so that it is possible to use an approximation method of solving for V_m explicitly. This could have been anticipated physically since the second term is proportional to span loading and we have seen that span loading has very little effect at high speed. The following is one of the shortest although by no means the most elegant of the methods of obtaining a simplified approximate expression for V_m from (9).

For simplicity let us rewrite (9)

$$\left.\begin{array}{l} V_m^3 = A - \dfrac{B}{V_m}, \quad \text{where} \\ A = \dfrac{361{,}100}{\sigma}\ \dfrac{l_p}{l_t}, \quad B = \dfrac{175{,}600}{\sigma^2}\ l_p l_s\ . \end{array}\right\} \qquad (10)$$

Then if we put

$$V_m = V_o + V_1 \quad \text{or} \quad \frac{V_m}{V_o} = 1 + \frac{V_1}{V_o},$$

where $V_o^3 = A$, we know that

$$V_1 << V_o \quad \text{or} \quad \frac{V_1}{V_o} << 1\ .$$

Hence in the exact relation

$$\left(\frac{V_m}{V_o}\right)^3 = 1 + 3\ \frac{V_1}{V_o} + 3\left(\frac{V_1}{V_o}\right)^2 + \left(\frac{V_1}{V_o}\right)^3$$

we can, to a first approximation, neglect the second and third terms, so that approximately

$$V_m^3 = V_o^3 + 3\,V_o^2 V_1,$$

and substituting this in (10)

$$V_o^3 + 3\,V_o^2 V_1 = A - \frac{B}{V_o\left(1 + \dfrac{V_1}{V_o}\right)},$$

and hence

$$V_1 = -\frac{1}{3}\ \frac{B}{V_o^3}\left(1 - \frac{V_1}{V_o} + \ldots\ldots\right),$$

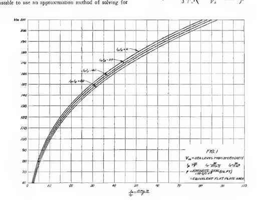


FIG. 1

or to our approximation

$$V_1 = -\frac{1}{3}\ \frac{B}{A}$$

Therefore

$$V_m = \left(\frac{361{,}100}{\sigma}\ \frac{l_p}{l_t}\right)^{1/3} - \frac{1}{3}\ \frac{175{,}600\, l_t l_s}{361{,}100\ \sigma},$$

or

$$V_m = \frac{71.2}{(\sigma)^{1/3}}\left(\frac{l_p}{l_t}\right)^{1/3} - \frac{0.162}{\sigma}\ l_t l_s \ \text{(ft./sec.)}, \qquad (11)$$

Finally, if we take $\sigma = 1$ and measure V_m in miles per hour

$$V_m = 48.6\left(\frac{l_p}{l_t}\right)^{1/3} - 0.11\ l_t l_s = \left.\begin{array}{l}\text{Sea Level} \\ \text{High Speed} \\ \text{in m.p.h.}\end{array}\right\} \qquad (12)$$

This very simple relation may be put in graphical form as has been done in Fig 1, and in this way gives sea level high speed with almost no labor in terms of three fundamental parameters: span loading, parasite loading, and thrust power loading. Numerical values given by (12) have been checked against flight test results obtained by the U. S. Army Air Corps at McCook Field[*] for thirty-two planes of widely differing types (pursuit, observation, bombing, transport, training, and messenger), the maximum difference between calculated and observed high speed being less than 1 m.p.h. The values of the parameters used in this check were obtained as follows: l_t was taken from normal engine BHp and the assumed maximum propeller efficiency corresponding to the observed high speed of the plane; l_s was determined from the geometrical dimensions and arrangement of the wing cellule, l_p was obtained from the structural flat plate area, as calculated at McCook Field from the observed high speed, plus the wing profile drag as calculated from wind tunnel tests. Hence the very close agreement obtained between high speeds measured and those obtained from our formula is a little misleading in that the designer could very seldom attain such accuracy in a performance prediction. The agreement really means only that, if the correct values of the parameters are known, our formula gives results which for all practical purposes are just as accurate as those obtained by the much more tedious "exact" methods.

The two great difficulties in the prediction of performance are the uncertainty as to propulsive efficiency and parasite drag, and these are of course not solved by any such considerations as those of this analysis. The first difficulty lies in the fact that the propulsive efficiency of a propeller with fuselage or nacelle may not be the same at all as that of the propeller operating alone. η is normally determined upon the latter basis and should properly be altered to take account of the altered conditions of any actual installation. However, since our knowledge of such effects is woefully meager, it seems that for the present it may be more satisfactory to take the "free propeller" value of η and include the effects of propeller interference in the parasite drag term. That this is at best a makeshift device is indicated by an inspection of equation (12) in which η (l_t) and parasite drag (l_p) occur in different manners. However it is the method which was adopted at McCook Field in the reduction of the flight test data, and it is certainly the simplest method at the present time unless specific data on propulsive efficiency is available for the particular plane under consideration.

[*]The data used in this paper is taken from the Air Corps Tech Rep A.D.M. 864, "Determination of Structural Airplane Drag" by Lieut. H. A. Sutton.

Table I, which has been taken or calculated from the McCook Field flight test data, has been appended to indicate the numerical values of the various parameters for several contemporary airplanes.

The second difficulty, namely, the determination of parasite drag, is also a very real one. There are three common methods of estimating parasite drag each of which has its own drawbacks. The first method consists in taking wind tunnel or free flight test values of the drag of the various components of the plane and adding all of the component drags to get the total. The difficulty here lies primarily in interference, i.e., in the fact that the total drag for two components very close to one another may be quite different from the sum of their individual drags when they are tested separately. The second method employs the results of wind tunnel tests of an accurate model of the complete plane, but here the difference in Reynold's Number, turbulence conditions, etc., between model and full scale conditions makes it very difficult to scale up the model results with any accuracy. The third method is essentially one of

Airplane	Type	Weight W (lbs.)	Engine Power BHp	Thrust Power Loading l_t	Span Loading l_s	Parasite Loading l_p	Obs High Speed V_m (m.p.h.)
VCP-1	Pursuit	2,669	351	9.74	2.39	315	154
MB-3	Pursuit	2,540	340	9.40	3.19	274	146
PW-8	Pursuit	3,151	442	9.03	2.47	364	165
PW-9	Pursuit	3,020	431	8.44	2.68	330	164
P-1B	Pursuit	2,932	436	8.37	2.67	303	160
XF-3A	Pursuit	2,665	434	7.75	2.42	250	134
XP-6	Pursuit	3,037	593	6.12	2.76	302	176
XP-8	Pursuit	3,116	468	8.01	3.06	381	173
Average				8.33	2.70	320	
DH-4M2	Observation	4,510	418	14.36	1.99	253	129
COA-1	Observation	5,066	439	14.60	2.01	264	124
O-1B	Observation	4,225	441	11.87	2.48	325	143
XO-2	Observation	4,785	432	13.71	2.22	276	129
O-2C	Observation	4,671	427	13.50	2.16	255	126
O-2B	Observation	4,484	430	12.77	2.30	285	133
O-11	Observation	4,561	430	12.88	2.69	379	140
O-6B	Observation	4,304	435	11.66	2.16	289	138
Average				13.17	2.25	291	
NBS-1	Bombing	12,064	836	20.39	1.77	197	99
NBS-4	Bombing	13,795	864	20.96	1.41	224	104
XLB-1	Bombing	10,346	791	18.04	1.84	270	121
XLB-2	Bombing	12,039	899	17.13	2.27	262	118
XLB-5	Bombing	11,932	854	17.24	2.12	225	108
XLB-6	Bombing	12,856	1,070	13.32	1.86	236	118
XB-2	Bombing	16,344	1,227	18.39	1.76	536	130
Average				17.73	1.85	250	
C-1	Transport	6,483	424	19.12	1.49	310	120
C-2	Transport	9,715	671	18.12	1.92	277	116
C-3	Transport	9,924	709	17.69	1.82	252	111
Average				18.31	1.73	275	
VE-9	Training	2,269	195	13.27	1.32	270	124
PT-1	Training	2,575	168	20.70	1.73	158	92
PT-3	Training	2,445	220	13.97	1.64	154	106
Average				16.65	1.63	194	
M-1A	Messenger	1,076	63	22.65	2.05	174	96

Table 1

comparison. Parasite drag is estimated from a knowledge of the parasite drags of other similar planes. All three methods require a great deal of experience and intelligence in their application if they are to be at all satisfactory.

A simple relation between high speed and parasite loading such as is given by Fig 1 should be of considerable assistance in connection with the third method, especially if the scheme suggested above of including propeller interference effects in parasite drag be used. For, from Fig. 1, the designer knowing the geometrical arrangement of the wing cellule and the normal engine

and propeller characteristics can very readily find l_p for an existing plane from the observed high speed, and can then use this value in the estimation of l_p for a new and similar machine[3]

Fig 1 should also assist in determining the propeller efficiency η (assuming propeller interference effects to be neglected) Knowing the design R.P M and the propeller diameter, the design maximum efficiency can be determined from the well known curve of maximum efficiency vs design V/ND, if V is known Assuming a value of V, η is determined and then from Fig 1 the actual V_m can be read off Using this V_m a new value of η is found and the process repeated until the value of V assumed in the determination of η and the value obtained from Fig 1 for that η agree. This can be carried out very rapidly until η has been satisfactorily determined

Certain of the standard formulas relating to power required have been stated in a form which brings out the nature of the physical dependence of the phenomena on two aerodynamic parameters span loading and parasite loading The implications of these formulas have been discussed in some detail The difficulties in getting accurate analytical expressions for power available in general have been mentioned and have been shown to disappear in large measure for the case of high speed level flight A simple analytical formula for maximum speed has been obtained which has also been exhibited in graphical form This formula involves the two above mentioned aerodynamic parameters and in addition one propulsive quantity the thrust power loading The possible uses of the high speed relation have been briefly considered

[3]In comparing planes of very different stalling speeds it is better to make the comparison using $l_s/$ (wing loading) which is proportional to the inverse of the absolute coefficient of parasite drag, and corresponds roughly to the Everling High Speed Figure

TECHNICAL REVIEWS

N A C A Report No 316—Tables for pressure of Air on Coming to Rest from Various Speeds, by A F Zahn and F A Louden

In Technical Report No 247 of the N A C A theoretical formulas are given from which was computed a table for the pressure of air on coming to rest from various speeds, such as those of aircraft and propeller blades In that report, the table gave incompressible and adiabatic stop pressures of air for even-speed intervals in miles per hour and for some even-speed intervals in knots per hour, kilometers per hour, and meters per second The pressure values in Table II are also more exact than the values given in the previous table.

To furnish the aeronautical engineer with ready numerical formulas for finding the pressure of air on coming to rest, Table I has been derived for the standard values specified below it This table first presents the theoretical pressure-speed formulas and their working formulas for several special units of speed

N A C.A Technical Note No 311—The Use of Wheel Brakes on Airplanes, by Thomas Carroll and Smith J DeFrance

This report discusses the use use of wheel brakes upon airplanes The results of tests to determine the effect of wheel brakes on the landing run of an airplane under various conditions of load and at various wind velocities are presented The advantages of the use of brakes in reducing the landing run and in increasing the facility of ground maneuvering are discussed, together with methods of operation and application.

N A C.A Technical Note No 307, Strength of Tubing Under Combined Axial and Transverse Loading, by L B Tuckerman, S N Petrenko and C D. Johnson, Bureau of Standards

It is believed by the Materials Committee that this report contains the first values for combined loading on tubes which are based on experimental data Curves and tables given in the report are said to be sufficiently accurate for use in design of a tubular member which acts both as a column and a beam Tests of duralumin tubing are in progress and will be reported later

N A C A Technical Note No 310—Wind Tunnel Pressure Distribution Tests on a Series of Biplane Wing Models Part I Effects of Changes in Stagger and Gap, by Montgomery Knight and Richard W Noyes.

This report furnishes information on the changes in the forces on each wing of a biplane cellule when either the stagger or the gap is varied The data were obtained from pressure distribution tests made in the Atmospheric Wind Tunnel of the Langley Memorial Laboratory Since each test was carried up to 90 deg angle of attack, the results may be used in the study of stalled flight and of spinning as well as in the structural design of biplane wings

N.A.C.A Technical Note No 308, Pressure Distribution on a Slotted R.A F 31 Airfoil in the Variable Density Wind Tunnel, by Eastman N Jacobs

Eastman Kodak Company booklet X-rays in Industry A brief survey of the theory and use of X-rays in industry.

S.A.E Semi-Annual Meeting paper, Mixture Distribution in Multi-Cylinder Engines, by M J Zucrow

S A E Semi-Annual Meeting paper, Report on Air-Fuel Ratio Tests, by H W Best, Sheffield Scientific School, Yale University

Written discussion of H W Best's paper, by Charles Louis Petze, Jr , Automotive Engineering Staff, Massachusetts Institute of Technology

S.A.E Semi-Annual Meeting paper, effects of a Centrifugal Supercharger on Fuel Vaporization, by C Fayette Taylor

S A E Semi-Annual Meeting paper, Combustion Chamber Design in Theory and Practice by W A. Whatmough.

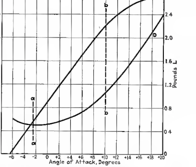
American Society for Testing Materials paper, Aluminum Alloys for Pressure Die Castings, by Sam Tour

A S.M E Aeronautic Division Paper—Aircraft for Passenger Transport, by Charles N Monteith

THE *Penaud* VERSUS THE *Canard* TYPES

By Albert Merrill

THE Penaud type is here defined as a system of surfaces spaced apart fore and aft, the front surface or surfaces being the supporting means, the rear surface acting as a stabilizer The Canard type is a system of surfaces spaced apart fore and aft, the rear surface or surfaces being the supporting means, the front surface acting as the stabilizer Penaud was a Frenchman who did a lot of valuable aeronautical research work in the seventies of the last century The Canard type is so named from its resemblance to a duck with its head protruding in front and no tail



If the supporting means consists of one surface both of these types are called monoplanes whereas in fact both are biplanes inasmuch as two surfaces are necessary for pitch stability Moreover, since the surfaces are spaced apart fore and aft and (if the c g is properly placed for static pitch stability) there must be decalage to obtain the proper trim angle, it follows that every so-called monoplane is, in fact, a stagger-decalage biplane

If normal flying range is defined as the range of angles covering the angle for maximum speed and the climbing and cruising angles, then for flying through the air there is no necessity of going outside this range except when one has to dodge a solid obstacle, when aerobatics may be necessary Also as long as one flies within this range the machine can never go out of control in pitch, yaw or roll, and there can be no nose dives, stalls or spins

The above graph shows the variation of lift and drag in pounds with angle of attack, D being the total resistance of the model The normal flying range lies roughly between the two lines *aa* and *bb*, differing, of course, with every model Let us compare the Penaud with the Canard type on a basis of these graphs The Penaud has the stabilizer at the rear, while the Canard has it at the front, both types being treated as rigid bodies in this comparison Note that within the normal flying range the rate of change of L with angle is greater than is the rate of change of D with angle that is the curve of L is steeper This means that within the normal flying range L dominates over D in determining the sign and magnitude of the static pitching moment couple It follows therefor that within this range, stable static pitching moment characteristics can be made the same for both types by placing the c.g properly and having the proper amount of decalage In this range of angles the Canard has an advantage inasmuch as its stabilizer lifts, whereas the Penaud stabilizer carries a down load

If now we consider the condition to the right of the line *bb* we get a very different result Here we find that the rate of change of D with angle of attack is greater than is the rate of change of L and this means that D will dominate It is just this that will always make the Canard type very dangerous in my opinion In the Penaud type the D of the stabilizer is always a righting force, like the feathers on an arrow, but in the Canard the D is always an upsetting force because the stabilizer is in front and at those angles where D dominates over L this upsetting force is going to cause accidents

British Methods OF

STEEL AIRCRAFT CONSTRUCTION

By W. H. Sayers

IN THE preceding article an account was given of the methods of steel construction employed by two aircraft manufacturers in Great Britain The work of the remaining firms which have contributed to the development of this type of construction will be outlined in this, the concluding article of the series.

Boulton & Paul Ltd , Norwich

As with the two firms previously considered, Boulton & Paul Ltd. have been engaged in the development of corrugated strip construction since before the end of the War At the Salon D'Aeronatique held in Paris in 1920 Boulton & Paul exhibited the P10, which was as far as is discoverable the first complete airplane constructed throughout from strip steel This machine is shown in Fig 29 The fuselage was framed in steel with longerons and oval frames of drawn sections, and the wings had spars of box section of corrugated strip

Except for the covering which was of fabric for wings, etc , and of a special fibrous material for the fuselage, the whole of the P10 was of steel

Since that time this firm has developed a mixed type of construction wherein steel is used for the more heavily loaded members and the light alloys in members less heavily stressed There are several marked advantages in this system One of the most important from the practical point of view is that it is possible to make the same section in, say, steel or in duralumin, and to obtain in either material practically the same strength weight ratio. For example, when two struts of the same overall length, one to carry less than the load of the other, are required, they may be made of the same dimensions and form, one in steel, the other in duralumin This materially reduces the cost of tools, etc

Moreover, there are many cases where steel sections for members such as ribs must be made unnecessarily strong owing to the difficulty of handling the very thin gages required, or where sections thick enough to stand up to normal flying stresses would be too delicate and flimsy to stand handling on the ground at the hands of the usual type of mechanic In these cases the thicker gages called for by the normal stress requirements will give to the light alloy member that robustness which may be lacking in the nominally equally strong steel section

This use of mixed materials is to be found throughout the structures of the firm's products It extends even to the construction of fairings, which though not actually primarily part of the structure yet require some greater degree of robustness than can be provided by fabric and formers, yet do not justify the use of metal covering Such items are made of spruce and three-ply By this choice of the material which may be most economically employed in each specific component remarkably low structure weights are a marked feature.

Wing spars are generally of the box type Fig 30 shows two examples of Boulton & Paul spars, one dating from 1919, the other a present day production which is used on the "Sidestrand" twin engine bomber Both sections have corrugated flanges, webs with fairly wide central flats which latter are supported and stiffened by a number of tubular distance pieces of special form The only differences of note between these two spars are that in the more recent type the crown of the flanges has been raised further from the level of the joints at the edges, thus increasing the effectiveness of this member and decreasing the stress intensity at the edges of web and flange, and that light cross strips have been added across these joints, thus ensuring the maintenance of accuracy of width across the joint lips As these lips are used to locate ribs this dimensional accuracy is a great aid to accurate assembly

A further difference not revealed by the figure is that the earlier spar was made from strip formed in the hardened state whereas the modern sections are formed from annealed strip and are hardened and tempered after forming

Fig 31 shows a range of standardized spars made by this firm It will be seen that there are on this figure three horizontal rows, each of six sections. All six sections in any one vertical row share the same web section Each spar in any one of the six vertical rows uses the same flange section Thus a total of nine component sections, calling for nine sets of tools, produces eighteen spar sections As each of the nine basic sections may be produced in several gages of steel on the

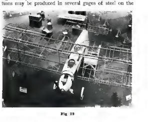
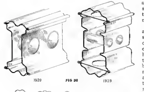


Fig 29

same tools, or if desired, duralumin may be substituted for steel, an enormous range of complete spars is available from a strictly limited tool equipment The range actually available is suitable for almost any size of machine between the limits of 2,000 to 20,000 lb. loaded weight

Fittings for struts, etc , are attached to these spars by the use of side plates rivetted to the outer sets of flats



1920 FIG 30 1929

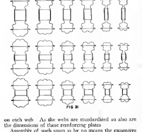


FIG 31

on each web As the webs are standardized so also are the dimensions of these reinforcing plates

Assembly of such spars is by no means the expensive process that it might appear The two web members are first assembled with their intervening distance tubes, which are spun down on the outsides of the webs The flanges with the stiffener strips already mentioned are then drawn over the lips of the webs and the component is then placed in a semi-automatic machine which spaces and drills the rivet holes in all four joints simultaneously While one set of holes is being drilled by the machine, rivets are being inserted in the last set of holes and clenched by a hand operated toggle press by the machine attendant In the event of a need for very greatly increased production, the development of an attachment which will automatically insert and clench the rivets would present no difficulty The labor cost of producing a spar of this type is at least as low as that of making a normal channeled or built-up timber spar of equal size and strength and, owing to the limited number of tools required under this system, the costs of tools is very moderate

For internal drag struts, and for fuselage longerons and struts, tubes of circular section are used Where such tubular members are very heavily stressed and consequently tubes of normal gage to diameter ratio may economically be used, solid drawn nickel-chrome tubes hardened and tempered are used For example, the central section of a fuselage and the engine mountings might be made of such tubes For conditions where an economical section would be of an impossibly thin gage in a solid drawn tube the firm produce the "locked-joint" tube section shown in Fig 32 This is made from strip material on the draw-bench in either steel or light alloy in lengths of up to 75 ft , perfectly straight and to such dimensional accuracy that machined sockets and sleeves to fit can be made to give certain interchangeability Tubes of this type made in a stainless steel with an ultimate tensile strength of over 90 tons per sq in are used for all the main longitudinal girders on R 101 the new 5,000,000 cu ft airship now being completed at the Royal Airship Works, and several miles of such tubes were made by Boulton & Paul to which many thousands of turned fittings were attached without any need for hand fitting

Such accuracy of dimension is not easily obtainable in any class of solid drawn tubing and certainly not in any material of such high tenacity Even more important than the accuracy of external dimensions of these tubes is their almost perfect uniformity of wall thickness

The range of sizes in which this type of tube is made ranges from 1¼ to 2¾ in diameter with wall thicknesses of as little as 0.018 in in the largest sizes Practically any desired steel may be used as well as duralumin or a similar light alloy The steel normally used in this form is a nickel-chrome-vanadium alloy, formed soft and hardened and tempered to give 75-80 tons per sq in tensile strength.

Interplane and other struts which are exposed to the wind are of compound construction, consisting of an ogival section metal nose, and a light tail fairing of three-ply with spruce formers As shown in Fig 33 the nose portion is made of a leading trough section to which is riveted a rear channel The timber fairing slips into the

32 33

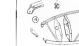


FIG.34

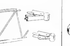


FIG35

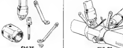


FIG.36

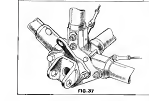


FIG.37

rear channel and the whole is then bound with fabric and doped

As with the spar sections, there are a limited number of standard strut component sections, all of which can be made in either steel or duralumin, and in a range of gauges, thus permitting of choosing a standard section for almost any loading condition

Ribs are made from duralumin For normal light ribs booms of a hollow "T" section (see Fig 34) with tubular braces are used The ends of the tubular braces are flattened, inserted between the double stalks of the "T" and riveted For ribs which must possess considerable lateral stiffness, a wide duralumin channel boom and slightly narrower channel braces are employed These ribs are considerably lighter than wooden ribs of equal strength for wings of a chord of 6 ft or over while in smaller sizes they are no heavier though generally considerably stronger, than the wooden ribs that would be normally used under the same conditions

To secure ribs to spars vertical duralumin channel members are rivetted to the rib booms, one on each side of each spar These give a clear gap slightly less than the overall width across the projecting lips formed at the four joints between spar flanges and webs Four notches are cut in the vertical channels on the ribs to register with these lips so that the ribs can be slid onto the spar The rib is finally secured in place by passing through the vertical channels and through the spar, via the tubular web-stiffeners, a short length of steel wire provided at one end with a jumped up head, and screwed and fitted with a bicycle spoke-nipple at the other

In the construction of fuselages standardized types of fittings are largely used For the rear sections of fuselages, "locked joint" tubing of steel is used for longerons and the more heavily loaded struts, and similar tubing of light alloy for less heavily loaded members The standard method of joining struts to longerons is to slide over the longeron tube a light alloy sleeve which is a push fit on the tube, and provides four external flat faces in two pairs mutually at right angles Two eyebolts, slightly staggered one to another, are passed through both sleeve and longeron These secure the necessary wiring plates and provide pin-joint attachments for socket ends pinned to the struts

Fig 35 shows the standard sleeve section, and Fig 36 a typical fuselage joint Sleeves of this type are also applicable to other types of joint as for example, that shown in Fig 37

This shows a joint for the attachment of a wing-spar to the fuselage of a high performance twin-engined bomber A machined fork, pinned to the fuselage cross member, has welded to it a pair of heavy flange plates The ends of two sections of the fuselage longeron tubes fit between these flange plates and are bolted to them One of these ends that for the rear section, is provided with a sleeve of the standard section to provide the necessary joint faces The other longeron tube, which has to transmit considerably heavier loads, has a special steel terminal The standard joint sleeve section is also used at the end of the vertical fuselage strut at this point

To transmit the large shear loads which may pass from wire or other bracings to the thin walled tubes used in this type of construction without either relying on the relatively weak sleeve material or using abnormally

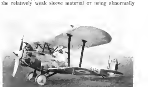


Fig 38

large diameter pins or bolts through the tubes "shear bushes" are employed These are short flanged hardened steel bushes just long enough to pass through the walls of sleeve and tube at each side, and drilled to take the bolts which pass through them in the case of joints such as those of Fig 37 Where a socket to transmit tension only is to be affixed to a thin walled tube, similar "shear bushes" held in place by tubular rivets may be used

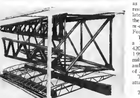
The use of a variety of metals in the same aircraft

structure as in this firm's practice renders it more than usually important to insure adequate protection against corrosion, and the mixed materials which are so used have only been adopted after much research on this aspect of metal construction

Of the various materials used, duralumin is that most open to suspicion on the score of corrosion British experience has shown that the process known as "anodic oxidation" carried out under proper control and with due regard to the composition of the particular alloy, followed by a coat of lanoline gives very satisfactory results if no conditions likely seriously to aggravate corrosion are allowed to occur But it is extremely important in a mixed structure to prevent corrosion of any metals other than the duralumin itself from occurring in contact with that material

Boulton & Paul has succeeded in producing the necessary types of steel sections for their own type of construction in stainless steel as has already been recorded But this material is expensive and difficult to work The nickel-chrome-vanadium steel which they normally employ for formed sections is much easier to work and far more uniform in its qualities than the stainless varieties at present available Moreover, it has a very clean and uniform micro structure and is little liable to corrosive

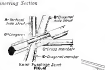
39



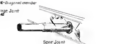
40

attack under normal conditions Properly cleaned, and coated with a cellulose lacquer, it is practically corrosion proof

Wiring plates and similar details are made from stainless steel, and machined parts, including screw threads, are zinc coated by a zinc vapor process which permits the deposition of an adherent, nonporous coating, whose



Rear Fuselage Joint
FIG.41



Spar Joint
FIG.42

thickness can be kept to within sufficiently fine limits not to interfere with interchangeability

Sockets for duralumin tube members—or steel ones where the loading permits—are the castings of a heat-treated aluminum silicon alloy which has excellent corrosion resisting qualities

Machines of this make have now been in service for several years without signs of trouble from corrosion. On one occasion the opportunity arose to make a performance test on a machine of this construction after two years of hard service The result of this test was practically identical with that obtained on its original tests, and rather better than the reverse This fact should go to substantiate the claim that a metal framed machine will maintain its condition in service better than will a timber framed one, and to disprove the suspicion that the British type of corrugated strip construction is as fragile as it looks to eyes unaccustomed to it

The Bristol Aeroplane Co Ltd

It has already been recorded that the first British machine embodying the corrugated type of strip construction was designed and built by this firm as long ago as 1918, and to this it may now be added that as the result of a competition held by the British Air Ministry late in 1927 the all-steel "Bulldog" single seat fighter by the same firm was adopted as the standard type for the re-equipment of the fighting squadrons of the Royal Air Force

This machine which is shown in Fig 38 is fitted with a Bristol "Jupiter" supercharged engine developing 420 hp at 12,000 ft Empty the machine weighs 1 990 lb It carries 605 lb of fuel and oil and 528 lb of military load including pilot guns, ammunition sending and receiving wireless, and oxygen making a total weight of 3 125 lb

Tested at 3,150 lb , the following performances were attained

Time from Start min	*Height* ft	*Level Speed* m p.h.
3 0	5 000	
6 0	10,000	177
9 5	15 000	174
14 2	20 000	168
20 5	25 000	162
32 5	30 000	

These figures themselves are sufficient evidence that machines of this construction are not in any way handicapped in regard to weight and performance by the

methods employed to produce them In this connection it is worthy of note that the makers guarantee to repeat the performance specified to within plus or minus 5 per cent on any machine of this type

The Bristol company uses steel exclusively for structural members of their all metal airplanes For machines with normal wing bracing arrangements box type spars of corrugated section are employed The web and flange forms are generically similar to those used by the last firm dealt with Some steel spars for cantilever wings have also been produced by this firm which employ corrugated flange sections with lattice type shear bracing Some examples of deep tapered spars of this type are shown in Fig 39, and Fig 40 shows an assortment of aircraft components of their make

An interesting item in this figure is the section of fuselage frame which is entirely made from formed strip Longerons and struts are made from two strips each rolled or drawn to an arc of a circle with two projecting lips The two lips are rivetted together to form a lipped tube The longerons have lips at 90 and the struts at 180 deg and joints between the two types of members are made by means of plates rivetted to the lips of both members as shown in Fig 41

Solid drawn tube is used in this firm's practice for interplane struts, drag struts and the forward heavily stressed section of fuselages In the case of the "Bulldog," above mentioned, the interplane struts and wing bracing wires are attached not to the spars directly but to steel tube drag struts which pass through stiffener plates riveted to the sides of the spar and through the spar itself. This arrangement is indicated in Fig 42.

The H G Hawker Engineering Co. Ltd.

This firm is a comparatively late entrant into the ranks of steel constructors. Its efforts have been largely directed to the development of methods of construction of the simplest possible type For wing spars they have developed the "double eight" section shown in Fig 43

43

44

This is produced by rolling an initially round solid drawn tube to shape, and is obviously a cheap and simple spar to produce It is only possible to produce this section in steel of medium tensile strength and in relatively thick gauge and it is therefore heavier than the strip type so far described Expressed as a percentage of spar weight this excess weight is quite considerable, but in small machines the net additional to the total weight of the machine is relatively small and this type of spar has obvious merits However, it is not possible to neglect

45

even relatively small increases of weight in airplane structures if they can be avoided and the firm has recently developed the type of spar shown in Fig 44 This is of the strip type very similar in form to the Armstrong Whitworth type, but has tubular booms formed from one width of strip and has only two rows of rivets thus marking a step toward cutting out this process of jointing the components of this type of spar

Ribs by this firm are in general of aluminum or of duralumin, stamped from sheet metal, though a variety of types have been tried and still more are, it is believed, in course of trial

The method of fuselage construction developed by this firm is of very considerable interest on account of its simplicity Circular section solid drawn tubes are used for both longerons and struts Where joints occur the longeron tubes are flattened by a simple hand rolling machine and flat fish plates are attached to these flats by one cup headed bolt. Struts in the plane of the fishplates are provided with squared or flattened ends which fit between the plates and are fixed by spun hollow rivets Struts in the plane at right angles are provided with ball-ends which fit into the cup-heads of the bolts mentioned The side girders of the fuselage are made as separate units with rigid tubular lattice bracing Top and bottom faces have ball-ended struts and wire crossbracing Fig 45 shows a typical joint of this type.

Conclusion

This article is by no means a complete account of all British achievements in steel construction Such a complete description would occupy an inordinate amount of space. For this reason it is possible that many details which deserve attention have been omitted or too briefly mentioned It is desired to express to all the firms mentioned the writer's thanks for the information which they supplied to him and without which this article could not have been written

In conclusion it should be understood that most of the types and methods of construction described are fully covered by patents held by one or another of the firms who have been mentioned

Everywhere throughout your ships

. . . color . . . beauty . . . luxury

Du Pont supplies modern materials to meet in applying color scientifically—countless smart refinements in cockpit and cabin

WITH the growing trend toward non-professional flying—beauty, style and color assume a new importance in the manufacture of planes. Private ships must now compete in styling, as well as in technical design—every type of airplane must meet ever higher standards of refinement, luxury and comfort

Pioneers in the production of aircraft finishes, du Pont today supplies a complete line of materials for modern needs. For wings—clear dopes, pigmented dopes, standard Army and Navy finishing materials For fuselage—Duco, fuselage varnish and spar varnish. For other wood and metal parts—special primers and sealers, aircraft enamels, dope-proof paints and lacquers. In fact, for every part of the ship, the du Pont line provides a finish in its highest stage of modern development

Style Experts at Your Service

With the introduction of Duco for use in homes, on automobiles and other manufactured products, du Pont established a special department for the study of color trends and color fashions The du Pont Color Advisory Service is in constant touch with aircraft styling in both America and Europe It will gladly cooperate with you in planning up-to-the-minute harmonies for your ships

Complete information on any du Pont product for airplane use will be furnished either by mail or by a qualified representative.

AIR-TESTED FINISHES

Du Pont Dopes—The du Pont line of aircraft finishing materials includes clear, semi-pigmented and pigmented dopes They are all tested formulas of remarkable durability—proven in service as well as in the laboratory Flexible and highly blush-resistant, the Army and the Navy have approved these products for their requirements Available in a wide variety of highly visible colors

Du Pont Paints and Varnishes—Du Pont chemists have developed a complete line of paints and varnishes including Dope-proof Paint, Spar Varnishes, Fuselage Varnish and Aircraft Enamels

DU PONT
REG U S PAT OFF

E. I. DU PONT DE NEMOURS & CO., Inc.

Industrial Finishes Division, Parlin, N J.

2100 Elston Ave , Chicago, Ill. 351 California St , San Francisco, Cal.

Flint Paint and Varnish Limited, Toronto, Ontario, Canada

the new style-trends in aviation—cooperates Pyralin and Fabrikoid adapt themselves to—add new beauty, luxury and serviceability.

MORE closely every day, the marketing of aircraft parallels that of modern motor cars Beauty, comfort — *style* — become essential Luxury attends each feature of interior design

To give your ships these important selling attributes, no other two materials offer such unusual possibilities as du Pont Pyralin and Fabrikoid. Extremely light, ideally durable, and beautiful in the most modern sense, these materials are uniquely fitted for service in the air

Pyralin in various colors and effects provides transparent cabin windows, instrument boards and wing lights of smart appearance and utmost serviceability Its unusual characteristics offer amazing opportunities for other original applications Complete information on Pyralin and its many present uses will be furnished on request

Fabrikoid brings aeroplane upholstery up-to-date Its lightness and toughness unmistakably distinguish it as a material destined for air service And the designs of the new Nemoursa Aeroplane Fabrics express vividly the buoyance and gaiety of this most modern mode of travel

Du Pont technical men are ready to co-operate wholeheartedly in original styling with these materials. Please write direct to the division concerned

AIR-TESTED MATERIALS

Du Pont Fabrikoid—Sturdy Fabrikoid is an ideal material for open cockpit upholstery Will withstand varying weather conditions "Nemoursa Aeroplane Fabrics" are new type, light weight materials developed for interior trims of cabin ships Made on a high grade woven cotton base and treated with appropriate pyroxylin colors. Embossed in distinctive patterns

Du Pont Pyralin—A strong durable, light, unbreakable transparent material furnished in any gauge from 5/1000 upward in sheets approximately 20 in x 50 in Ideal for windshields, cabin windows, running lights and other uses

DU PONT
REG U S PAT OFF

E. I. DU PONT DE NEMOURS & CO., Inc.

FABRIKOID DIVISION Newburgh, New York

DU PONT VISCOLOID CO., Inc

330 Fifth Avenue, New York City

MEMBER OF AERONAUTICAL CHAMBER OF COMMERCE

THANK YOU *for mentioning* AVIATION

"I Prefer U. S."

"I'VE been about everything from machinist's helper to master mechanic ever since 'hoss car' days. And I've been thrown with nearly every breed of tool there is—even had 'em thrown at me.

I'm here to tell you I've never handled tools that perform like the good old U. S., in the army and out. U. S. not only gave us the world's first portable electric drill, but gave us just about all the worthwhile drill features in use today—the fan-cooled universal motor, the SKF Ball Bearing armature, chrome nickel, steel gears, one-piece frame and commutator head—everything that makes for dependable performance under continuous heavy load, low maintenance cost, and amazing long life. Try 'em. Then you'll know why U. S. drills are 'the good mechanic's choice.' "

U. S. ¼" Special Drill
2000 R.P.M. Load Speed
$24

U. S. ¼" Heavy Duty Drill
2000 R.P.M. Load Speed
$44

U. S. ¼" Regular Drill
2000 R. P. M. Load Speed
$33

Ask Your Jobber or Write Us

THE STANDARD OF QUALITY SINCE 1897

THE UNITED STATES ELECTRICAL TOOL COMPANY

Oldest Builders of Electric Drills and Grinders in the World

2466 West Sixth Street — Cincinnati, Ohio, U. S. A.

Atlanta, Boston, Chicago, Cleveland, Dallas, Denver, Detroit, London, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Syracuse, Toronto, Winnipeg

Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York City

MASTER OF THE SKIES

A Greater AMERICAN EAGLE *Family*

American Eagle A-129 Curtis OX-5 powered

THROUGHOUT the development of Aircraft manufacture American Eagle has maintained a position of true leadership. From the introduction of its first model, the A 129 to its latest model, the Wallace Touroplane, American Eagle has led with its record of structural stability, unfaltering performance, faithful service, and its wide range of models.

The American Eagle family, today, is greater than ever before. Its line is complete. Its models are designed to meet a popular demand, and are backed by the unlimited cooperation of a well known, powerful company and a nation-wide selling organization. American Eagle offers you a *dependable* plane to fit every purpose at a wide range of prices.

Once you ride in any one of the many American Eagle models, you will know why American Eagle has held a position of leadership since its beginning. Go to your nearest American Eagle dealer and have him demonstrate an American Eagle. A card from you will bring complete descriptive literature on all models. American Eagles may be purchased now on a surprisingly convenient time payment basis.

Certain valuable territories are open for well qualified distributors. Write or wire today for full information.

Use this coupon only

Name ....

Address ....

City .... State. ....

Occupation .... Age ....
A 8-17

The Wallace Touroplane is manufactured by the Wallace Aircraft Company, Inc., a division of the American Eagle Aircraft Corporation

AMERICAN EAGLE AIRCRAFT CORPORATION
FAIRFAX AIRPORT — KANSAS CITY, KANS.

The American Eagle Model 39 Phaeton Three-place open cockpit Biplane powered with the Wright Whirlwind 5, 165 H. P. Motor; Wright Whirlwind 7, 220 H. P. Motor, the Hisso "A" 150 H. P. Motor or the Hisso "E" 180 H. P. Motor.

The Wallace Touroplane, three-place cabin monoplane, powered with the Kinner 102 H. P. Motor. Full equipment and luxurious cabin appointments

The American Eagle Biplane, a Kinner powered plane which has gained recognition for its stability, maneuverability and performance

A PLANE FOR EVERY PURSE AND PURPOSE

Davis Sales
ARE MADE IN THE AIR

IT is an interesting fact that every Davis V-3 Monoplane has *sold itself by performance.*

Equally significant is the fact that the orders which have been placed for Davis V-3 Monoplanes have been placed *not* by inexperienced fliers, but by fliers of long experience.

The Davis V-3 Monoplane is the kind of a plane that fliers everywhere have been wanting—but cannot believe has been produced, until they actually fly the V-3

It is staunch and rugged—economical to maintain and operate—thoroughly modern from nose to tail—that much you can tell by an inspection on the ground. But when you take it off and land it yourself—when you sense its unusual stability in rough weather—when you test the remarkable control at stalling speeds

See our *Exhibit at the* CLEVELAND AERONAUTICAL EXPOSITION

—*then* you will realize that the Davis V-3 is an ideal airplane.

We will try to arrange an early demonstration for you if you write.

Many rich territories are still open. Responsible dealers are invited to write for complete details of the Davis Franchise.

DAVIS AIRCRAFT CORPORATION
Richmond, Indiana

PERFORMANCE (Actual)

Service Ceiling	10,000 feet
High Speed	95 M P H
Landing Speed	38 M P H.
Cruising Speed	80 M P H.
Climb	700 ft per minute
Fuel Consumption at Cruising Speed	4-1/2 gallons per hour
Cruising Range	350-400 miles

$2965
Flyaway at field
Complete with LeBlond 60 H.P. Radial Engine

DAVIS V3 MONOPLANE

A TWO-PLACE HIGH-WING MONOPLANE — "THE AMERICAN MOTH"

In the St. Louis Robin

Bethlehem Cylinder Forgings were used in Curtiss "Challenger" Motor which drove plane through 420-hour non-stop flight, to new record.

Cylinder forgings must be as nearly perfect as human skill can produce, and the steel used must be "right" in every way. Both by facilities and experience, Bethlehem is equipped to make this highly important part. During the present year, this Company has supplied thousands of cylinder forgings to prominent engine builders.

ONLY the finest, most conscientious workmanship, combined with flawless materials, could produce a motor capable of such performance. It is significant that the all-important cylinder forgings, on which so much depended during the "Challenger" Motor's steady, unfaltering 17½-day run, were made by Bethlehem.

Significant, because so many of the motors that have driven other planes on memorable flights during recent years had vital parts made from Bethlehem Forgings.

Bethlehem Forgings were used in Lindbergh's "Spirit of St. Louis" — in the "America," in which Byrd and his companions made their trans-Atlantic Flight—in the "Columbia," which Chamberlin piloted across the Atlantic—in the plane in which Maitland and Hegenberger made the first flight from San Francisco to Hawaii—in the "Question Mark"—and in the Ford planes of the Transcontinental Air Transport Company Fleet.

Bethlehem Forgings are used extensively throughout the aeronautical industry—not only in famous planes but in many hundreds of ships, which, by their smooth dependable, day-after-day performance, are safely and efficiently carrying on the business of air transportation.

BETHLEHEM STEEL COMPANY, ***General Offices:*** **Bethlehem, Pa.**
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland and Honolulu.

BETHLEHEM

AIRPLANE STEELS FORGINGS

This is one of a series of advertisements directed originally to advertising men in an effort to make general consumer advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility

Getting the cart
(distributor)

BEHIND the horse
(consumer)

"A" and "B" are manufacturers of high grade radio sets. Both are seeking national distribution.

"A" appropriated $400,000 in 1928 for an advertising campaign in general mediums to create distribution through consumer demand. He by-passed the dealer—didn't consider his selective function.

"B" went after it differently. He appropriated $125,000 for general consumer mediums and $25,000 for the papers of his trade. He intended to create distribution direct and along with consumer demand. He recognized that if the dealer had a place in his sales program then the dealer's magazine had a place in his advertising program. *Radio Retailing* was used as his key paper.

A recent accounting shows that "B" sold three times as many radio sets as "A" during 1928.

There are some advertising men like "A" who earnestly believe that consumer demand by itself automatically organizes distribution. Over a long period it may possibly do so. But what about the manufacturer who cannot afford the long-haul expense—the manufacturer who must seek his profits from economies in marketing as well as production economies—the manufacturer beset with serious price competition?

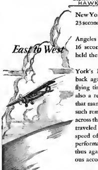
The wrong use, the improper balance of advertising has often turned users of advertising into foes or skeptics. It is not a question of one type of medium in preference to another but a matter of common-sense principles of merchandising. With these understood and applied an effective, economical program of advertising is inevitable.

McGRAW-HILL PUBLICATIONS

New York · Chicago · Cleveland · Detroit · Philadelphia · St. Louis
Greenville · San Francisco · Boston · London

Hawks and Wasp
break more trans-continental records

Captain Frank M. HAWKS



Captain Frank M. Hawks and his "Wasp" powered Lockheed Air Express have broken more transcontinental speed records. They now hold both the East to West and West to East mark.

The new non-stop time from New York to Los Angeles is 19 hours, 10 minutes, 23 seconds. The old figure was 24 hours, 51 minutes.

The new non-stop time from Los Angeles to New York is 17 hours, 38 minutes, 16 seconds. Captain Hawks and the "Wasp" held the former record of 18 hours, 21 minutes.

The elapsed time from New York's Roosevelt Field to Los Angeles and back again was 44 hours, 48 seconds...actual flying time 36 hours, 46 minutes, 48 seconds... also a record. It was the first time in history that man had flown coast to coast and return in such remarkable time. To set these new marks across the skyways of the continent, the "Wasp" traveled approximately 5300 miles at an average speed of 144 miles per hour. The outstanding performance characteristics of the "Wasp" are thus again strikingly emphasized by conspicuous accomplishment.

THE PRATT & WHITNEY AIRCRAFT CO
HARTFORD · · · CONNECTICUT
Division of United Aircraft & Transport Corporation

Manufactured in Canada by The Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by the Bavarian Motor Works, Munich.

Wasp & Hornet
ENGINES

KITTY HAWK

Flies Like a Hawk—Lands Like a Kitten

A Kinner Powered Ship—Unusually Economical

The new Model B-4 3 place Kitty Hawk is low in first cost—low in maintenance. The ideal ship for training schools and commercial purposes. ... Requires only small fields. High percentage of useful load to gross load. Investigate

BOURDON AIRCRAFT CORP.
HILLSGROVE, R. I.

TITANINE

Registered Trade Mark

A Complete Range of

AIRPLANE FINISHING MATERIALS

Dope-proof paint, black, white, aluminum or grey;
Clear nitrate and acetate dopes;
Ti-Two colored one-material dope;
Pigmented nitrate dopes;
Flexible wing lacquer;
Wood and metal lacquer (for inside and outside finish)

TITANINE, Inc.
Union, Union County, New Jersey
Contractors to the United States Government

Don't Overlook Opportunities

Men who regularly keep in touch with the market through other channels often overlook the many opportunities that are to be found in the

SEARCHLIGHT SECTION
For Every Business Want
"Think SEARCHLIGHT *First"*
0158

The Budd Wheel Company

Makers of Wheels for airplanes

PHILADELPHIA AND DETROIT

PROPELLERS
HARTZELL
PROPELLER FANS
PIQUA, OHIO, U.S.A.

20 Years Experience Behind Our Service
HARTZELL PROPELLER CO. PIQUA, O.

FAIRCHILD cabin monoplanes and open biplanes form a complete line of quality aircraft for dealers' sales. Fairchild aviation products also include pontoons, skis, landing lights and engines. Dealers address Fairchild Airplane Manufacturing Corporation, Farmingdale, L. I., U. S. A.

AIRPLANES

NICHOLAS-BEAZLEY ··· IS AS NEAR YOU AS YOUR TELEPHONE ·CALL MARSHALL, MO. 1400·

"Same Day" Shipment on Supplies You Need... Complete Aeronautical Stocks at Your Command!

CATALOG "G"
New 1929 Revised Edition Catalog "G" now ready for you. If you haven't received your copy write us. 200 pages full of tested and proven aeronautical accessories. Most complete ever issued

Shock Cord New production guaranteed fresh stock

Landing Lights

Flightex Shirts

Flying Suits

Aviation Lights

Tires and Tubes

American Propellers

Nicholas-Beazley Airplane Company Inc.
Marshall -- Missouri

WESTERN BRANCH
3700 S. Moneta Ave., Los Angeles, Calif.
AUTHORIZED DEPOTS
Brodauw Millard Aeronotive Corp.
604 Broadway, Kansas City, Mo.
Booger Brothers, Conrad, Montana
Air Activities, Incorporated
Supply Division
8-10 E. Kinzie St., Chicago, Ill.

Standard Sizes For Department of Commerce Class "A"-"B"-"C" Airports

Easily, quickly, and economically erected—Sectional units bolted together on the field assure easy dismantling and moving—Sturdy arch construction with substantial doors—Ample side space for office, shop or storage—Exterior fire hazard minimized by Toncan Iron, Asbestos, or Prepared Roofings—Non-breakable celo-glass windows.

Save a third. *Write for bulletin.*

NO-TRUS HANGAR CORP.
Home Office: Esperson Bldg., Houston, Tex.
Eastern Office: 140 Cedar St., New York, N. Y.

JAEGER

8 Day Watch

Chronograph 8 Day

Time of Flight Watch, 8 Day

IN Airplane timepieces Jaeger instruments lead the field. These accurate precision made Swiss-American watches are the first choice of the foremost European and American flyers. 8 Day Timepieces with or without Chronograph (Stopwatch) or Time of Flight features. These models mount flush on the panel and have front wind and set. Radium treated dials if desired.

JAEGER WATCH COMPANY
304 EAST 45TH ST. NEW YORK CITY
London Geneva Switzerland Paris
8 DAY WATCHES FOR AUTOMOBILES

AERONAUTICAL TIMEPIECES

WHERE TO FLY

WHERE TO FLY

AIRCRAFT SERVICE DIRECTORY

See our Advertisement on page 8 of this issue
PIONEER INSTRUMENT COMPANY
754 LEXINGTON AVE. BROOKLYN NEW YORK

Distributors of
Flightex Fabric
Crystal Clear
Dopes
Supreme
Propellers
Haskelite Plywood
B. G. and A. C.
Spark Plugs, etc.

We carry a complete assortment of Aeronautical parts and supplies, maintain a cylinder service department, shipments made the same day order is received. Get our prices on Dopes

JOHN S. COX AND SON
222-226 So. 7th St. Terre Haute, Ind

OX-5 SPECIALISTS

We carefully complete line of parts for OX motors at attractive prices. Also general utility material and accessories. Cylinder repairing. Send for 1929 Catalogue No. 7.

MONUMENTAL AIRCRAFT, INC.
425 Equitable Bldg., Baltimore, Md.

FIRE-PROOF STEEL HANGARS

Send for Plans and Specifications
APPROVED BY DEPT. OF COMMERCE
AIRPORT HANGAR CO.
Cyclone Fence Building
Long Island City, N. Y.

OX5 Cylinders

Reground and fitted with new pistons, wrist pins, rings, valve seats and valve guides. Hisso & OX5 crank shafts reground. Main bearings rebabbitted like bored and fit.

KEMP MACH. CO.
Muncie, Ind.

PLYCOR AIRCRAFT PLYWOOD MEETS ALL TESTS

Furnished in the following thicknesses: 1/32"—1/16"—1/8"—3/16"—1/4" ... Plycor plywood is furnished for any use and with a guarantee of quality ...

THE PLYCOR CO. 1216 So. Western Ave., Chicago

Phoenix Clear Nitrate Dope

$1.35 in 50 gal. wood barrels.
$1.37 in 30 gal. wood barrels.
$1.25 in 5 gal. bucket cans.
Immediate shipments F. O. B. factory. All freshly made from raw and high grade materials.

PHOENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y.

Paragon Propellers

Paragon Engineers, Inc., 241 Oriole St., Baltimore, Md

AVIATION PROTECTION, Inc.
INSURANCE BROKERS TO AVIATION
110 WILLIAM STREET
NEW YORK

Actual Size
SEND
ONE DOLLAR

We will send you by return mail a beautiful pin of sterling silver wings mounted on bar pin with safety catch, also identification card issued by National Flyers Ass'n. These pins are being worn by thousands of aviators, aviation mechanics and boosters.

Illustrated booklet describing Davenport's large Airport and school mailed with each order.

Iowa-Illinois Airways Inc.
Davenport, Iowa

PITCH & BANK INDICATOR

Your Position at a glance
Booklet "BIKKEN Navigation Instruments" sent on request.
BIKKEN INSTRUMENT COMPANY
1819 Fairmount Ave., Philadelphia, Pa.

LUDINGTON

Distributors, Agents for New Aviation Equipment ...
AIRCRAFT CONSTRUCTION
Ludington Philadelphia Flying Service Inc.
Philadelphia

GARDNER PROPELLERS

In Stock or on Short Notice
12 Years' Experience
GARDNER PROPELLER WORKS
Forest Park, Ill

HASKELITE

PLYWOOD

Used by every important builder. Recognized as the standard plywood for airplane construction. Over 30 applications. Blue print data book on request.

HASKELITE MFG. CORPORATION
120 S. LaSalle Street, Chicago, Illinois

PITCH INDICATOR

Adjustable Zero
Readable at a Glance.
Booklet on Request

Pioneer Aircraft Products
Box 283 New Haven, Conn.

TRIUMPH

MAGNETIC
FUEL GAGES FOR AIRCRAFT
NEW MODELS FOR COWL,
WING OR SPECIAL TANKS
Manufactured by
The Boston Auto Gage Company
PITTSFIELD MASSACHUSETTS

STEARMAN, D. H. MOTH AND MONOCOUPE

GEO. A. WIES, Inc.
Hangar and Office Roosevelt Field 2 — Garden City New York

SEAMLESS STEEL TUBING

Made to Aircraft Specifications 10225-D
Warehouse stock also mill shipment

The Cleveland Tool & Supply Company
1427-1437 West Sixth St. Cleveland, O

AIRPLANE SPRUCE

Rough Green Kiln Dried Rough Air Dried or Finished to your sizes. Prompt shipments in carloads and less than carloads. We supply many of the largest manufacturers in the United States and Europe.
Specialists in Airplane Spruce for Fifteen Years
J. V. G. POSEY & COMPANY
Public Service Building PORTLAND, ORE.

FLOTTORP

The Standard of Aircraft Propellers for Twenty Years
THE
FLOTTORP PROPELLER COMPANY
Grand Rapids, Michigan

Professional Services

SHOWALTER-ASSOCIATES
Aircraft Planners, Architects, Engineers
2210 Park Ave.
DETROIT
Suite 247 — Write or Wire

AERO-KEN

Aeronautical Engineering
Complete Design
and Stress Analysis
800-806 Investment Bldg.
Washington, D. C.

Aeronautical Engineering

Aeroplane Design
Airport and Airline Layout
Stress Analysis—Final Layout
and Research
By Competent Engineers
B.D. 171 Aviation
520 No. Michigan Ave., Chicago, Ill.

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD
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Box Numbers may be in care of our New York, Chicago or San Francisco offices.
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FOR SALE

ARROW 6 new complete re-cover and overhaul powered with new Hisso E 180 carrying 100 hour guarantee $2,300. 1928 American Eagle complete overhauled motor $1,800 less motor $1,100. Southern Iowa Airways Inc., Bedford, Iowa.

AVRON Arian with less than 98 hours. Motor and ship have just been completely overhauled. Special equipment including a pair of Edo pontoons which have never been used. Sacrifice for an immediate sale. FS-179, Aviation, Tenth Ave. at 36th St., New York.

CLOSING out business, large amount motors, new and used equipment, parts, planes different makes will be sold one half their value. Now is your chance to get bargains. Write or wire your needs. York Airways, York, Pa.

COMMANDAIRE OX-5 new, Sept., 1928. Has 100 hours. Never cracked up. Perfect condition. Also two Russell Lobe chuted and one Hisso 180 motor. Just rebuilt. Ralph Wilson Jr., c/o Whittelsey Mfg. Co., Howard Ave., Bridgeport, Conn.

2 M F flying boats with model E Hisso for $3,500. One combination Eaglerock with de luxe Edo pontoons and OXX-6 motor for $2,500. 8 Model E Hisso motors overhauled $500 each. New Orleans Air Line, New Orleans, La.

EXPERIMENTAL monoplane for sale. OX-5 motor, 3 place, wonderfully stable. $1,800. Write for details. Pheasant Aircraft Company, Fond du Lac, Wisconsin.

FOR SALE. One 90 hp. LeBlond and one 35 hp. Anzani engine. Also have number of 60 hp. Velie M-5 engines purchased on large contract. Having now adopted 65 hp. engines as standard on new Golden Eagle airplanes, we are willing to sell these smaller engines which are all new at reduced prices. Golden Eagle Aircraft Corporation, 418 East Industrial Avenue, Inglewood, Calif.

FOR SALE. OX-5 American Eagle used 88 hours as demonstrator, dual controls, $2,300. One OX-5 American Eagle, used 200 hours, dual controls, navigation lights, booster, ocean stiers $1,680. Both ships inspected by Dept. of Commerce June 1st. Never been damaged and both in excellent condition. Del-Mar-Va Airport, Salisbury, Md.

FOR SALE

New Hisso Eaglerock

Delivered July 3, total hours 10, positively no damages of any kind, good reasons for selling—$2800

HARLEY MIETHE
Georgetown, Ill

5000 Propellers, 28 to 200 H.P.

War Surplus stored in dry warehouses and in good condition. Real Bargains in lots of 100 or more. Entire lot only $2 each. Samples at Booth 137, Cleveland Show.

SMITH MACHINERY CO.
Box 1343, Houston, Texas

TRAVELAIR-SPEEDWING

Curtiss Challenger Engine

Flown less than fifty hours. Complete set of instruments, brakes, self-starter, etc. Cost $7,800. Make offer.

STENGEL
Columbus 7700
70 Columbus Ave. New York City

FOR SALE

FOR SALE. One OX-5 motor complete ready to run $400.00. One OX-5 motor overhauled, bronze valve seats, silchrome valves less carburetor and valve action with enough spare parts for complete valve action, price $200.00. One Hartzel propeller with spinner $40.00. One Smith pick propeller $10.00. Waco 9 fuselage and tail assembly, seats and dual control with cowling. Best offer takes this. FS-189, Aviation, 520 No. Michigan Ave., Chicago, Ill.

FOR SALE—Ryan brougham C-4932 flown 182 hours privately used. Kept in government hangar. Price $8,000. Wire or write C. L. Semans, 407 Citizens Bldg., Fayette County, Uniontown, Penna.

FOR SALE by Distributor, one Whirlwind Laird nearly new. One Whirlwind Laird, factory rebuilt engine and new covering. One Speedwing 300 hp. FS-181, Aviation, Tenth Ave. at 36th St., New York.

FOR SALE—Fairchild model FC 2 W 2 Wasp motor. Less than two hundred hours. Perfect condition. Five bucket seats exclusive of pilot. Ample baggage space. Excellent ship for cross-country transportation. Will sacrifice for immediate cash. La Crosse Aviation Company, La Crosse, Wisconsin.

FOR SALE—New Curtiss Robin at a sacrifice, dual control and steel propeller. Perfect condition. No reasonable offer refused. Richard W. Lutz, Oshkosh, Wisconsin.

FOR SALE—Waco 10 OX-5 motor licensed, $1,800.00. Two late 1928 Travelairs OX-5 licensed $1,800.00 each. Monocoupe demonstrator like new $2,000.00. Curtiss Robin OX-5 new in June, $3,400.00. Two 80 gallon gas tanks suitable for refueling plane. 100 feet 1½" gas hose. Yellow Cab Airways, Inc., Des Moines, Ia.

FOR SALE. Motors OX-5, OXX-6, K 6, C-6, V-2, Hall Scott A7A. Write for complete price list. Airplanes-Motors-Parts. Southern Airplane Supply Company, 110 E. Vine St., Knoxville, Tenn.

FOR SALE. Model E Hisso excellent condition with New Hartzell propeller $800. 2 good OX-5 motors, $300 each. Crescent Airways Inc., 2717 South Claiborne Ave., New Orleans, Louisiana.

FOR SALE OR TRADE

SEPARATELY OR AS A WHOLE

1. One New Ryan Brougham B-1 Wright J5-CA. Has had only 15 hours' flying time.
2. One used Ryan Brougham B-1 Wright J5-CA. Total Time 280 Hours. Motor overhauled at 200 hours. Always housed and never cracked in any way. Excellent condition.
3. One Used Ryan Brougham B-1 Wright J5-CA. Total Time 500 Hours. Plane and Motor completely overhauled at 500 hours. Extra Centre Section Tank. Wing Landing Lights and Steel Propeller. This ship has never been damaged and always kept housed.

Will consider new or but slightly used Fleets, Travel Airs or Robins as part payment for items one and two.

Submit offers by mail to Box

FS-207 Aviation
Tenth Ave. at 36th St. New York, N. Y.

FOR SALE

FOR SALE. 1 new OX-5, 40 hours, $625. 1 used OX-5, $375. 1 late model Velie M-5 80 hours $725. Write or wire Earl C. Ewing, Aircraft Service, Bryan, Ohio.

FOR SALE. 30 OX-5 motors. Some rebuilt like new, rest as is. Price range $300-$500. FS-164, Aviation, Tenth Ave. at 36th Street, New York.

FOR SALE. Hisso Standard $1,200. first-class condition. Art Foster, Hadley Field, New Brunswick, N. J.

FOR SALE. 2 OX-5 motors, overhauled and in good condition. Price $320. Perry's Korner, 2800 McCallie Ave., Chattanooga, Tenn.

FOR SALE. one Standard J-1, one extra OX-5 motor, one Thompson exhibition parachute, one Dixie 800 magneto, one magneto distributor asp., one pair DB wheels. Also some other OX-5 parts, etc. R. V. Zimmer, Warsaw, Ind.

ORT

Allows Inspection

You take no chances when you order motors from me as I make all shipments "subject to inspection"

DELIVERED FREE

All orders received during the month of August for any of the motors below will be delivered free of charge anywhere in United States. No charges for crating.

Brand new Liberty 12	$350
Used Liberty 12	300
Brand new Hammondsport OX-5	850
Brand new Wright 300 hp	350
Overhauled Hisso 180 hp	850
Government overhauled Hisso, 150 hp.	600
150 hp. Hisso needing overhaul	350
220 hp., Hisso, less magnetos	250
60 hp Anzani with propeller	450
New 120 hp. LeRhone	125

I have Hispano Model A, E, E-2, E-3 and E-4 parts, as well as H, H-2 and H-3 parts and invite inquiries on your needs.

KARL ORT, York, Pa.

FOR SALE

FOR SALE—Velie Monocoupe. Blue, new A1 reliable, smooth running motor and only by experienced private pilot, never scratched. Bargain if bought immediately. FS-220 Aviation 520 No Michigan Ave Chicago Ill

FORTUNE in airplane sales. Under this plan a salesman should sell at least one Eaglerock a month—a net monthly income for him of from $1,000 to $1,500. Our two weeks' free sales training course is open to you. We supply salesmen who qualify with a free demonstrator Eaglerock. You can offer buyers an easy plan of time payment. Write for details. Alexander Aircraft Co. Dept. 11 Colorado Springs Colo.

GOOD OX-5 Standard J1 airplane for sale. Ship completely rebuilt and tested. By retiring. Price $900. Shaag Short Kilbourne Iowa

GOVERNMENT overhauled OXX-6 Curtiss motor equipped with all extras, starting system and propeller, crated. Good for 300 hours without having quit. $475 each. Engine Products 1211 Preston St Rockford Ill

HENDERSON motor converted. Prop hub new parts. $140 crated, ready to fly. Excelsior Hemilrreen Co, Wichita Kan

KARI-KEEN small cabin monoplane. Velie motor both new, demonstrator condition, under 25 hours. Will sacrifice cash or terms. Write with 2 hours, Philadelphia Pa.

LE RHONE rotary complete original crate with spare parts. Must sell in a difficulty for $125. R Wilson Locust Ave Amsterdam N Y

LICENSED Pitcairn Fleetwing OX-5 motor new when installed. Ship and motor has 68 hours. Perfect condition. Motor turns up 1400 on ground. Hartzell propeller, dual Pioneer compass. Wired for navigation lights. Reasonable. FS-217 Aviation Tenth Ave at 36th Street New York.

NEW OXX-6 motors in original boxes, very reasonable price. Will ship with privilege of inspection. Grant Marine Motor Company 2023 St Clair Ave Detroit Mich.

ONE overhauled OX-5 motor for sale, turns 1,400, first $400 check will take it, also J-5 and standard J-5 parts of all descriptions. John J Mueler Bayport Long Island N Y

OX-5 Standard for sale in good shape except lower rear spar repairing. Motor OK. $300 takes it. Roy R Smith 174 Stevens Ave Highland Park Mich

Closing Out

1—WACO 6 Fuselage complete less motor. Just overhauled, new leather upholstering, new mahogany plywood flooring, seats, instruments, a beautiful job in A1 condition, steel landing gear, all instruments, radiator, cowling, ready for motor and wings, complete tail surfaces $200.

Complete set of JN4D wings with ailerons, fittings, wires and struts, complete set of tail surfaces, almost all parts for a complete fuselage, tank, controls, radiator, cowling, landing gear parts, etc., all in good condition, wings have no broken or patched spars. The whole works for $150.

HUNT AIRWAYS
Box 115, Hillsgrove, R. I.

OX-5 Swallow plane for sale with lower right wing damaged. Motor turns 1400 on ground. Price $1,200 cash. E Harrison, Park Rapids R F D No 3 Minn Box 50

OX-5 Eaglerock, beginning licensed, dual motor, 1 hours since complete overhaul, turns 1,425 on ground. $1,500. H. Abrigan, Schererville, Indiana.

PARACHUTES new and used, rope ladders for night work etc. Special weight. Thompson Bros Balloon and Parachute Co Aurora, Illinois. Established 1903

PRACTICALLY new Nieso E Eaglerock, eight hours flying. Price for quick sale. FS-204 Aviation Tenth Ave at 36th St New York

REAL bargain for early buyer Arrow Sport Le Blond 60 h p, three production. Hugh Rockwell Freeport, Long Island 4853.

RYAN Brougham. First reasonable offer for a real buy, flying perfect, will be accepted. Used by owner only for pleasure. Motor checked and engine changed every 15 hours. 438 Prail St Buffalo N Y

SLIGHTLY damaged Monocoupe with Velie M-5. Needs work on one side wing and undercarriage. No spars damaged. Bargain for mechanic or anyone having all instruments. Price $800 or close offer. Terms. Write Knight, 416 Mechanics Institute 57 Post St, San Francisco Calif.

SWALLOW in perfect condition. Will sacrifice for quick buyer or will exchange for Sudan. Hector 4234 Broadway N Y. Wash Heights 3170

STUDENTS here is a chance to buy 100 hp Irwin 9 cylinder 400 pounds motor that will fly any 2 or 3 passenger plane. $150. On terms. City Garage Cairo Ill

THOMAS MORSE OX-5 for sale like new, wings, covers, engine, motor new. Terms to local party. R Burkstrom 1000 No Keystone Ave Chicago, Ill

TWO upper and left lower wings for OX-5 Travel Air for sale. Perry Korner, 2600 McCallie Ave Chattanooga Tenn

TWO overhauled Hisso motors 180, very reasonable. FS-216 Aviation, Tenth Ave at 36th Street, New York

WACO BARGAINS—For quick sale $1,500, $1,800 and $2,000. Two OX-5 motors, turn 1,400 on ground $400 and $500. New York Aircraft Distributors Inc Roosevelt Field Long Island N Y

WHY pay big money for 50-hour flying course? Buy a new or used WACO from us and get some instruction FREE. Robbins Flying Service Akron O.

WACO ten for sale as good as new. Motor completely overhauled turns 1,400 on ground. Hartzell propeller, compass and bank indicator. With motor $1,600, less motor $1,275. Jenny new wood and covering, motor turns 1,400 on ground, with motor $750, less motor $400. Will accept good car on either ships. Address Carl Seltzer R D No 1 Union N Y

WHIRLWIND Waco J-5 engine. Good as new. Bendix wheels and brakes, hand inertia starter, steel propeller, aero struts, baggage compartment, air speed indicator, compass, bank and turn indicator. Cheap for cash. FS-214 Aviation 520 No Michigan Ave., Chicago Ill

Two Cabin Airplanes
Used Less Than 100 Hours

2—Fairchild five place Cabin monoplanes model FC 2 for sale. One has had forty hours, the other ninety. Wright J-5 225 hp engine. Complete equipment including air speed, turn and bank, compass, wheel brakes, folding wings etc. Condition good as new. Just the airplane for passenger carrying, taxi work, photography and advanced instruction. Located near New York. Attractively priced for quick sale.

Wire Box FS 221 Aviation
Tenth Ave at 36th Street New York

EQUIPMENT WANTED

WANTED Converted Henderson engine with hub, not cracked. State immediate cash price. Condition and type of conveyance in first letter. Manager Stockton Airport Stockton Illinois

WANTED Fuselage and landing gear for OX-5 Travel Air. Perry Korner 2600 McCallie Ave, Chattanooga Tenn

WANTED Henderson aircraft motor and two Heath wheels. State price and condition. Tri Cities Air Service 100 Francis St.

WANTED three Velie or Le Blond cylinders rebuilt, and cheap for cash. Also Heath motor. Standard J1 or Lincoln Standard in wanted, in the country for cash $750. Collier Palmer Eastwood Mexia Texas

PERSONAL

JOE LEFOREST parachute jumper. Someone wishes to know address. Write 1530 North 18th Street Kansas City Kansas immediately

POSITIONS VACANT

ENGINEERS, experienced in airplane stress analysis and design. Excellent opportunity to become familiar with all types of airplanes and in contact with the field of wide reputation. State qualifications. Aeronautical Engineers Building New York N Y

WANTED transport pilot and plane to operate and manage a good airport in Illinois State. For particulars write P 213 Aviation 520 No Michigan Ave., Chicago Ill.

POSITIONS WANTED

DESIROUS of connecting with a financially sound manufacturer. Transport pilot, pilot instructor and testing. Mechanic capable of taking charge of installation and testing all motors. Production manager thoroughly familiar with modern aircraft production. Start in Bulch. PW 211 Aviation 520 No Michigan Ave., Chicago Ill

ENGINEERING staff now building successful plane desires to make a change. PW 181 Aviation 520 No Michigan Ave Chicago Ill

The Searchlight Section of this paper

is devoted to the advertising of idle used and surplus new machinery, positions wanted and vacant, and all other business "Opportunities" identified with the field covered by this paper.

Buyers and others consult "Searchlight" ads for what they want.

You can reach them quickly and at small cost through an advertisement in the Searchlight Section.

G 12

POSITIONS WANTED

EXPERIENCED aircraft factory production manager now employed desires change. Long life at installing production material control and cost systems directing personnel and field managing. Best references. Army air corps reserve officer. PW 218 Aviation Tenth Ave at 36th Street New York.

LICENSED pilot instructor in flying during war. 1,000 hours flying time, graduate of four year aeronautical engineering course, thoroughly experienced in all branches of aviation, desires connection with active aeronautical concern. PW 188 Aviation Tenth Ave at 36th St New York

LICENSED airplane and engine mechanic. At present employed as chief mechanic. Eight years experience, over 200 hours solo flying, private party or company references. PW 215 Aviation 520 No Michigan Ave., Chicago Ill

LIMITED commercial pilot age 28 desires flying position with any concern, corporation or individual. Single, unattached, will go anywhere. N H Perry 8 Dover Road Wellesley Mass.

PILOT 2,500 hours war time pilot, instructor and cross country experience, desires permanent position, have credentials. Box 4 Birrfield Virginia

TRANSPORT pilot, war trained, flying steadily 1,740 certified hours, practically all types. Considerable airport, airway planning, photographic work. Desire transport or technical position established organization. 32, married, abstemious, excellent references, go anywhere. PW 210 Aviation Tenth Ave at 36th Street New York

TRANSPORT pilot wishes position private or commercial. Would prefer position as second pilot on Amphibian. Geo Krisa 178 Cleveland Avenue Mineola Long Island, N Y

POSITION VACANT

An Excellent Opportunity

for aeronautical engineers and draftsmen to get in on the ground floor of an aircraft company that believes in the future of aviation. The company has sound financial backing and is in no sense promoting a stock selling scheme. If you are interested in affiliating with a company that believes in a high standard of quality, wire or write for further particulars thoroughly outlining your qualifications and position desired. Aerodynamics, structural materials, specifications, weights, project and design engineers, also layout and detail draftsmen desired.

Tulsa is one of the most progressive cities in the United States. Living conditions are ideal.

Rex B Beisel, *Chief Engineer,*
SPARTAN AIRCRAFT CO
Tulsa, Okla.

POSITION WANTED

Sales Representative or Executive Engineer

thoroughly experienced in sizable projects desires position with organization where following experience is of value:
4 years technical education civil engineering, 18 years engineering experience includes 10½ years general construction such as Municipal Railroad Terminal Facilities, Piers, Docks and Concrete Dams.
5 years Sales Engineer and District Manager, 2½ years on hangar construction.
Held Dept. of Commerce Pilot's License (Limited Commercial rating), age 34, married, 3 children. Location immaterial. No objection to travelling. At present employed. PW 212 Aviation
Tenth Ave at 36th St., New York City

TECHNICAL SERVICE
217 Broadway New York City
Specialists in Technical Personnel
CHEMICAL ELECTRICAL CIVIL MECHANICAL AVIATION

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Wanted to Buy
One copy each of N A C A annual reports 1918, 1923, 1926. John McK. Bailey c/o Ford Instrument Company, Bawser St and Nelson Ave., Long Island City N Y

BUSINESS OPPORTUNITIES

CAPITAL or backer for the development of the most scientifically designed safe and noiseless airplane. Rises and descends vertically. Forward speed from 1 to 180 m p h. Low manufacturing cost. Can be housed in a garage, rises from the back yard. Patent pending. Geo Lehberger 28 Hillside Ave Union N J

Established Airport Near Large City
It is well located and the only one privately owned. It more than pays expenses and is a wonderful opportunity for right person. Will give reason for selling upon inquiry but must have quick action. Will expect and able to give best of references. BO-283 Aviation Tenth Ave at 36th St., New York

For Sale
Established airport 112 acres close to Cleveland. Only airport in Elyria of 40,000 inhabitants. Hangar and refreshment stand on field. Two modern homes optional. Elyria Air Service Inc. Grafton, Ohio R F D No 2

MISCELLANEOUS

ATTENTION Aviators. Valve guides installed in OX cylinders $1.50 per guide, removable valve seats installed $1.50, descriptive literature upon request, all work guaranteed. Illinois Flying Co New location 4 West 4th St. Sterling, Ill

REBUILD your OX5 with removable graphite guides, inserted seats and oversize valve action pins. OX5 and Hisso parts. Write for circular. Heckmar Machine Works 4028 West Lake Street Chicago Illinois

LATEST design welded steel tubing sport plane fuselage including split type landing gear, tail skid, tail assembly with tubular controls ready for covering and wings manufactured by government licensed mechanics, complete with rust proof coating inside and out, carefully crated for $198 or will manufacture to your specifications if desired. H & H Fuselage & Motor Company 2903 Mt. Vernon Ft Worth Texas

FREE BULLETIN

MOTOR Repair & Mfg Co 1549 Hamilton Avenue Cleveland Ohio—Stock Catalogue No 44 of new and rebuilt electrical machinery including motors, generators, plating dynamos, motor-generator sets, transformers, converters, engine-generator sets, ventilating fans, etc. Indexed, illustrated and with prices.

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Opportunity to Buy

Cabin Plane and Design

One of the leading commercial aircraft manufacturers has an 8-place cabin monoplane, with design and engineering data, less Wright J-5 motor, for sale. The design is by a nationally recognized aeronautical engineer. The ship has been satisfactorily test flown and only the manufacturer's decision to concentrate in the small ship field prevents it being placed in production. This is an attractive purchase for a manufacturer who wishes to enter the cabin field with most research completed or for a newly incorporated company wanting something tangible to offer its stockholders. Priced for immediate action.

Box FS-172 Aviation Magazine
Tenth Ave. at 36th St. New York City

Learn Welding

LEARN WELDING and lead burning in the best equipped school in St. Louis, day and evening instruction, no classes, each student has unlimited personal instruction, no time limit. Full course on all the common metals including aeronautical tubing only $100. Get your money's worth. Aeronautical Engineering Company, 7903 Shenandoah Ave., St. Louis, Mo

AVIATION—Salary while learning, $18 to $38 per week, while under instruction in our factory and shops. Call or write for information without obligation. AERO CORPORATION OF AMERICA Department AV 63 Second Street Milwaukee, Wisconsin

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375 acres 6½ miles from heart of city, 2 miles closer in than Municipal Airport. A real investment at $400 per acre. See me at Cleveland Show, Booth No. 197, Cleveland Hotel, at night.

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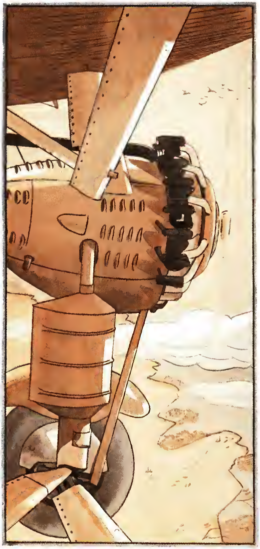
ALPHABETICAL INDEX TO ADVERTISEMENTS

THE NAME OF WRIGHT IS ONE OF AVIATION'S ASSETS



MILLIONS of men have yet to fly. Some will never do so. But as succeeding thousands come to decide that they will ride the air the name of Wright is one of Aviation's assets.

For in the minds of millions the name of Wright . . . the reliability of Wright . . . the endurance of Wright . . . give confidence and courage to the neophyte of the air when for the first time, he sweeps upward in the skies.

The name of Wright is one of aviation's assets. It is so not to the lone benefit of ourselves, but to every man who builds a plane—to every man who takes his living from the air. For the job of all of us in aviation is to build this kind of confidence; to work together as business men should; to take from aviation its heroic tinge, and to clothe it with confidence and every-day reliability.

Last year set a new record in the total of passengers carried for hire. 1929 will see more millions climb into planes for their first trips. Many more will enter flying schools. Many will buy their own planes. All are hastened in these decisions by their knowledge of Wright's proven dependability.

WRIGHT

AERONAUTICAL CORPORATION

PATERSON, NEW JERSEY